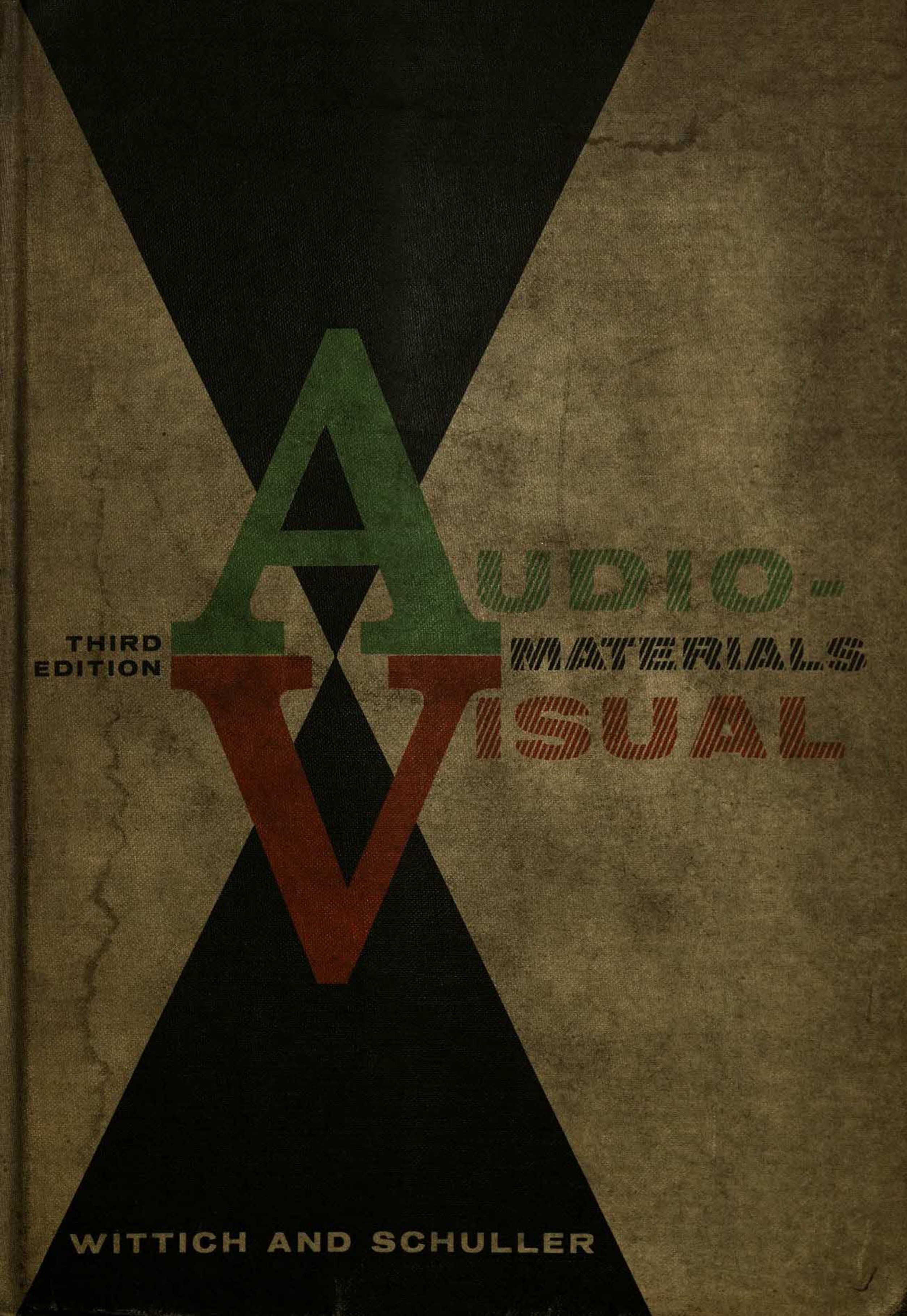

THIRD
EDITION

AUDIO-VISUAL MATERIALS

WITTICH AND SCHULLER

1763

AUDIOVISUAL MATERIALS

EXPLORATION SERIES IN EDUCATION

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AUDIOVISUAL MATERIALS: THEIR NATURE AND USE

THIRD EDITION

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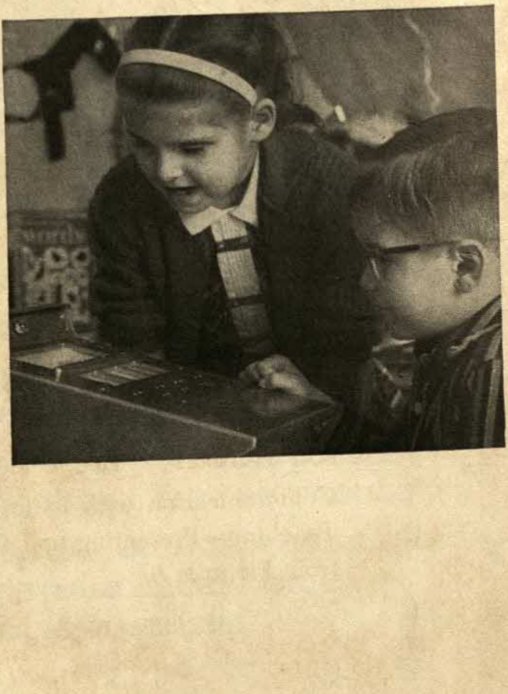

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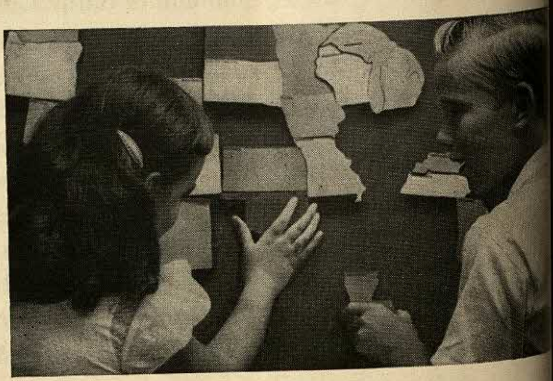

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EDITOR'S INTRODUCTION

Hearing, seeing, looking, and listening are the primary means of human learning. What we see and hear markedly influences how we behave. Because teaching at its best is the stimulation and direction of learning, what learners look at and listen to are major factors in the effectiveness of learning. Furthermore, the interplay of looking and hearing clearly influences how well people learn. Although this is true of learners at all age levels, it seems particularly cogent among young learners.

Thus it can be observed that not only the materiel of learning but also its arrangement and use are essential for maximum learning. It is startling to realize how recently learning materiel conceived and produced by man has been made available. The printing press did not appear until the middle of the fifteenth century. The radio for general use made its entry during the 1920s. Television became commonplace in the early 1950s.

These and numerous other communication devices make it possible for the teacher to stimulate and direct learning in a fashion heretofore unknown. It therefore seems clear that the teacher of today, whether in elementary or secondary schools, undergraduate or graduate institutions, must become intimately familiar with learning materiel in order to approach complete effectiveness.

This volume presents a happy combination of scholarly and usable means by which teachers in all fields, dealing with all age levels of students, can become adept in the use of audiovisual materials. It is a thorough revision of the parent work which was published in 1953, a second edition of which was released in 1957.

The acceptance of the two previous editions of *Audiovisual Materials* in this country and throughout the world is telling proof of the widespread assistance which Dr. Wittich and Dr. Schuller have rendered to teachers in diverse fields, institutions, and locales. The present edition includes rich additional treatment of human learning, along with descriptions of and suggestions for using audiovisual materials. It will prove invaluable to all those concerned with learning and teaching.

JOHN GUY FOWLKES

November, 1961

PREFACE

The third edition of *Audiovisual Materials—Their Nature and Use* is dedicated to the task of assisting schools and colleges endeavoring to meet the challenges of our rapidly changing world. Always an important goal, excellent and efficient instruction is now widely recognized as crucial in meeting those challenges. Also coming to be widely acknowledged is the essential need in such instruction of a large variety of audiovisual resources and media and of teachers skilled in their use. This book is designed to be of assistance on both counts.

We have prepared this edition in order to retain the best materials in the earlier editions, to bring such information up to date in terms of current developments, and equally important, to describe new developments which should be considered by those who attempt to improve classroom instruction through audiovisual means. The reader will discover that developments of the last five years have been treated in a manner which anticipates the use of these materials, equipment, and techniques in the course of on-going classroom instruction. Included is information about total television instruction, the language laboratory, and automated learning materials. We have also listed the significant developments in projected learning materials, study displays, listening techniques, and 16mm. sound motion picture films.

During the 60 years which represent our combined teaching experience, we have taught in the intermediate grades and in junior and senior high schools, have both served as supervisors and administrators in public schools, and are now professors of education at our respective universities. Because we teach courses in audiovisual instruction, we have been able to subject the contents, organization, and ideas of the earlier editions of our book to the practical test of day-to-day teaching among both pre-service and inservice teachers. As we continue this testing, we conscientiously seek up-to-date answers to such questions as: Does the content anticipate the audiovisual needs of teachers in their daily classroom work? Should some areas of content be expanded or emphasized? Which of the new audiovisual educational developments and techniques should be added as fruitful methods of improving the quality of classroom instruction?

Our answers to these questions are evident in this new edition. We now submit them to you in the hope that, as we seek to solve the perplexing problems of communication efficiency in our day-to-day teaching, together we may become more efficient in using the newer media.

One important innovation made in the second edition was the wording of the captions for illustrations so that they became an inherent part of the text itself. This proved to be such a workable idea that it is being continued in the third edition. The captions stimulate thoughtful consideration of both text and illustrations, help clarify concepts which are primarily visual in nature, and encourage questions and meaningful discussion. Answers to significant questions will thus be found partly within the experience of the instructor, partly in the text, and partly in the captions and illustrations.

This revision continues to explore the philosophy that seeing and hearing, looking and listening, *have been* and *will continue to be* the major ways and means by which human beings learn. It provides a basis for and a guide to broader and more efficient opportunities for learning. We have described applications so that they will be understandable and valuable both to the teacher in training and the teacher in service. Thus it is the central purpose of this third edition not only to describe the materials of audiovisual instruction, but to suggest methods and plans for the most efficient utilization of these important new media techniques in daily classroom work.

This edition, like its predecessors, emphasizes the cross-media approach to learning; that is, the responsibility and opportunity of the teacher to select from the variety of audiovisual and verbal techniques those which, when used in juxtaposition, will produce the highest level of learning opportunity.

The professional assistance of many persons has contributed to this edition. We are deeply indebted to Professor John Guy Fowlkes, former dean of the University of Wisconsin School of Education, and now currently engaged in conducting important research studies in teaching improvement. His continuing interest in the role of audiovisual materials as a means for improving instruction is evidenced by the number of research projects using audiovisual communication materials and techniques to be found within the Wisconsin Improvement Study.

We wish to express our deep appreciation to the many who gave competent and generous assistance: Miss Elizabeth Golterman, St. Louis; Mr. Albert K. Nielson, Madison College, Tennessee; Mr. Harry A. Johnson, Virginia State College; Mrs. Margaret Divizia, Los Angeles; Miss Martha Gable, Philadelphia Public Schools; Messrs. Horace Hartsell, James Page, and Wilfred Veenendaal, Michigan State University; Mr. Guy Michener, Des Moines; Mr. Rolland Schlieve, Cape Girardeau; Mr. Lee Campion, National Education Association; Mr. Lee Cochran, State University of Iowa; Mr. Wilton E. Williams, Sul Ross State College; Mr. Robert de Kieffer, University of Colorado; Mr. Neville Pearson, University of Minnesota; Miss Laura Johnson, Professor Emeritus, University of Wisconsin; Messrs. Frederick White, Richard Hubbard, Robert Reed, Philip Lambert, and Maurice Iverson, University of Wisconsin; and Mr. Carl Guell, Educational Consultant, Wisconsin State Aeronautics Commission.

We also wish to acknowledge the helpful suggestions given and the evaluation carried on by the following members of the audiovisual television experimental project in applying team teaching techniques to the conduct of audiovisual professional course work: Mr. Charles Wedemeyer, University of Wisconsin Extension Division; Dr. Frederick White, Mr. Lee Campion, and Professor Richard Hubbard, already mentioned; Professor Wesley Meierhenry, University of Nebraska; and Vigo B. Rasmusen, Wisconsin State College at La Crosse.

Still further acknowledgment is made to Dr. Philip Lewis, Chicago Public Schools; Dr. G. M. Torkelson, Pennsylvania State University; and Mr. Paul Thompson, Associate Editor, *Dateline Science,* Madison, Wisconsin, for their ideas and suggestions concerning innovations to be found in this edition.

We thank the many graduate students who, through their own inservice teacher training activities, helped test ideas and practical suggestions included in the second edition, and who made further suggestions included in this edition.

We wish to acknowledge our deep appreciation to Miss Dorothy Thompson for editorial advice and to Miss Elizabeth Stitgen, Mrs. Ruth Murphy, Mrs. Beverly Mlejnek, Miss Faith Sweet, and Mrs. Barbara Shea for their valuable assistance in typing and proofreading.

Since a book about audiovisual materials must rely heavily on pictures, charts, and other visuals, we expressly thank in an acknowledgment section the various individuals and companies who supplied many of the illustrations. The quoted passages used to amplify our ideas are acknowledged in footnotes.

WALTER A. WITTICH
CHARLES F. SCHULLER

January, 1962

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Aero Service Corporation: Fig. 7.15, 7.23.
Alexander, Theodor Walter: Fig. 15.11.
American International Association: Figs. 4.3, 4.4.
American Iron and Steel Institute: Figs. 4.9, 4.10, 5.14.
American Optical Company: Figs. 12.12, 12.19 (left), 12.20, 12.21, 12.22.
American Petroleum Institute: Fig. 5.11.
American Photocopy Equipment Company: Fig. 4.21.
American Transit Association: Fig. 15.6.
Ampro Corporation: Figs. 10.9, 10.11.
Atkeson, Ray: Fig. 4.17.
Atlanta (Georgia) Public Schools: Fig. 14.6.
Bausch & Lomb Incorporated: Figs. 12.8 (bottom), 12.25.
Bell & Howell: Figs. 11.9 (middle), 13.9 (left).
Bernstein, Lawrence, and Hughes, G. W.: Fig. 7.17, color plate facing page 216 (top).
Charles Beseler Company: Figs. 4.23, 12.18 (left).
Bland, Leslie: Fig. 11.1.
Boeing Airplane Company: Fig. 7.1.
British Information Services: Fig. 9.2.
Burbank (California) Public Schools: Fig. 8.18 (left).
Chicago Board of Education: Fig. 10.10.
Chicago Tribune: Fig. 15.4.
Consolidated Vultee Aircraft: Fig. 7.4.
Coronet Instructional Films: Figs. 1.1, 1.4, 13.20, color plates facing pages 370, 371 (right top and left second from bottom).
Creative Educational Society, Inc.: Fig. 4.13.
The Davis Press: Fig. 5.18, all except leftmost poster.
Denoyer-Geppert Company: Figs. 7.2, 7.3, 7.12 (right), 7.13, 7.25 (right), 8.10, color plates facing pages 178 and 179.
Eastman Kodak Company: Figs: 12.17, 13.9 (bottom right), 13.21; also photograph at beginning of Chapter 13.
Educational Development Laboratories: Figs. 1.5, 12.16.
Encyclopaedia Britannica Films, Inc.: Figs. 2.1, 12.6 (all on page 318, page 319, center and top right), 13.3, 13.6, 13.10, 13.11, 13.12, 13.14, 13.27, 15.7, color plates facing pages 370 and 371 (left top, left second from top, right second from top, and left bottom).
Fairchild Camera and Instrument Corporation: Fig. 13.26.
Farm Security Administration: Fig. 4.11.
Farquhar Transparent Globes: Figs. 7.10, 7.20 (left).
Ford Foundation: Fig. 14.8 (bottom).
Fox, Fontaine: Fig. 5.21.
General Biological Supply House: Fig. 15.12.
General Dynamics Corporation: Figs. 4.2 (left), 12.2.
General Electric Company: Fig. 12.19 (right).
General Electric Company—Missile and Space Vehicle Dept.: Fig. 1.2.
The General Electric Company and Pictorial Media, Inc.: Fig. 5.23.
Glencoe (Illinois) Public Schools: Fig. 7.7.
Graflex, Inc.: Figs. 11.9 (right), 13.9 (second from left).
C. S. Hammond and Company: Fig. 7.6.
Hammond (Indiana) Public Schools: Photograph at beginning of Chapter 6.
Harrison, Richard E.: Fig. 7.19 (top).
Hedrich-Blessing: Figs. 6.1 and 6.12 (left) (Suter).
The Instructor: Figs. 5.20, 12.14.
International Communications Foundation: Fig. 4.5.
International Harvester Company: Figs. 4.11, 8.7, color plate facing page 224 (top left and right).
International Movie Producers Service: Fig. 9.1.
The Jam Handy Organization: Figs. 3.2, 12.6 (p. 319, top left and center).
Janesville (Wisconsin) Public Schools: Fig. 8.12 (bottom).
Kalart-Victor: Fig. 13.9 (second from right).
Keystone View Company: Figs. 12.13, 12.15.
La Mesa–Spring Valley (California) School District: Photograph at beginning of Chapter 9.
Langley, J. Alex: Color plate facing page 88.
Link Aviation, Inc.: Fig. 8.13.
Los Angeles (California) City Board of Education: Figs. 7.22, 8.15, 8.17, 9.3, 10.13, 12.11, 12.24, photograph at beginning of Chapter 5.
Lysted, Olav: Fig. 4.16.
Madison (Wisconsin) Public Schools: Fig. 2.4.
Manual Arts Press: Fig. 3.7.
Match-a-Tach Company: Fig. 6.12 (bottom right).
The Microcard Corporation: Fig. 12.28 (top right and bottom).
The Midwest Program on Airborne Television Instruction: Figs. 14.9, 14.10.
Milwaukee *Journal:* Figs. 9.8, 14.2.
Minneapolis *Star* and *Tribune:* Fig. 5.4.
Minnesota Mining and Manufacturing Company: Figs. 9.7, 11.2, 11.5, 11.6, 11.7, 12.8 (center and bottom).
Moody Institute of Science: Color plates fac-

ing pages 370 and 371 (right, second from bottom and bottom).
Mt. Wilson and Palomar Observatories: Fig. 4.6.
Museum of Modern Art: Fig. 5.15.
Museum of Science and Industry: Fig. 8.20, color plate facing page 225.
National Association of Educational Broadcasters: Fig. 14.5.
National Conference of Christians and Jews, Inc.: Fig. 4.1.
National Dairy Council: Fig. 5.17.
National Education Association: Fig. 7.17.
Newcomb Audio Products Co.: Fig. 10.15.
A. J. Nystrom and Company: Fig. 7.8, 7.9, 7.12 (left and center), 7.14, 7.18, 7.19 (center and bottom), 7.24, 8.4.
Oak Ridge (Tennessee) Public Schools: Fig. 2.10.
Page, James L.: Fig. 13.1.
Pan American World Airways: color plate facing page 130 (top).
Panoramic Studios: Fig. 7.11.
Parade, The Sunday Picture Magazine: Fig. 2.2.
Peterson, Lewis V., Wilbur Schramm, and the *Audio-Visual Communications Review:* Fig. 5 6.
Pictograph Corporation: Fig. 5.8.
Pittsburgh Plate Glass Company: Color plate facing page 217.
Pittsburgh (Pennsylvania) Public Schools: Fig. 3.16.
Projection Optics Company, Inc.: Fig. 12.18 (center).
Radio Corporation of America: Fig. 13.25, photograph at beginning of Chapter 14.
Realistic Visual Aids: Fig. 2.7, 2.11, 7.24, 8.2, 8.11, 8.16, 11.3, 13.23; also photographs at beginning of Chapters 7, 12.
Recordak Corporation: Fig. 12.28 (top left).
Revell, Inc.: Fig. 8.3.
Rheem Califone Corporation: Fig. 16.1 (center); also photograph at beginning of Chapter 16.
St. Louis (Missouri) Board of Education: Figs. 4.14, 7.25 (left), 8.1, 8.9, 8.18 (right), 10.6, 12.9; also photograph at beginning of Chapter 4.
San Diego County (California) Department of Education: Fig. 9.4 (left).
Santa Barbara (California) City Schools: Fig. 10.5.
Santa Fe Railway: Figs. 4.2 (second from left), 4.8.
Sawyer's, Inc.: Figs. 12.8 (top), 12.26, 12.27.
Schneider, Franz: Color plate facing page 89.
Scott, Foresman and Company: Fig. 2.8, *Thorndike-Barnhart Beginning Dictionary,* © 1959; Fig. 2.9, *Thorndike-Barnhart High School Dictionary,* © 1957. Copyright by Scott, Foresman and Company, and used with their permission.
Shorewood (Wisconsin) Public Schools: Fig. 15.3.
Society for Visual Education: Figs. 8.5, 12.6 (left center, bottom three), 12.7 (right), 12.10.
Spindler and Sauppe, Inc.: Fig. 12.8 (center).
Standard Oil Company (N.J.): Fig. 4.15.
Standard Projector and Equipment Co., Inc.: Fig. 12.7 (center).
Standard School Broadcast: Fig. 6.7.
Steelways: Fig. 5.13.
Stephens College: Fig. 9.5, 9.6.
Tacoma (Washington) Public Schools: Fig. 6.3.
Teaching Film Custodians, Inc.: Fig. 13.15.
Teaching Machines, Inc.: Fig. 16.1 (left).
TelePrompter Corp.: Fig. 1.6.
Trans World Airlines, Inc.: Color plate facing page 130 (bottom).
Trees for Tomorrow, Inc.: Fig. 9.4 (center, right).
The Twentieth Century Fund: Fig. 5.7
United Nations: Fig. 4.7.
United Feature Syndicate: Fig. 5.22.
U.S. Department of Agriculture: Figs: 5.2, 5.3, 5.4, 5.5.
U.S. Department of State: Fig. 5.12.
U.S. Department of the Air Force: Fig. 4.2 (two to right), 7.20 (right), color plate facing page 216 (bottom right).
U.S. Department of the Navy: Fig. 5.10.
United States Plywood Corporation: Figs. 3.1, 3.12, 3.13, 3.15, 3.18; also photograph at beginning of Chapter 3.
United World Films, Inc. Figs. 13.13, 15.2.
University of Tennessee: 11.8, 12.3.
University of Wisconsin Station WHA: Fig. 10.7.
Veenendaal, Wilfred: Fig. 4.19, 4.20, 4.22, 8.19.
Viewlex, Inc.: Fig. 12.7 (left).
Visual Education Consultants: Figs. 1.2, 4.13 (right).
Ward's Natural Science Establishment, Inc.: Color plate facing page 217, lower left.
Wayne University: Fig. 6.12 (left).
Webcor Sales Company: Figs. 10.2, 10.4, 11.9 (left); also photograph at beginning of Chapter 10.
Webster Electric Company: Figs. 10.3, 15.8.
Western Design Corp.: Fig. 16.1 (right).
The White House: Fig. 12.1.
Wisconsin Journal of Education: Fig. 7.16.
Wisconsin State Journal: Fig. 15.5.
Wittich, Lois: Fig. 3.10.
Wittich and Felton: Fig. 3.5, 3.6, 3.8.
Yale University Press Film Service: Fig. 13.2.
Zenith Sales Corp.: Fig. 10.14.

AUDIO VISUAL MATERIALS

CHAPTER 1

THE TEACHER AND COMMUNICATIONS

THE TEACHER STANDS at the vertex of great change. Never in history has change so severely taxed the ingenuity of the classroom teacher in his effort to keep abreast of subject content as well as methods of communicating ideas. In a few brief decades teaching has changed from an almost complete dependence on face-to-face verbal instruction; today it requires knowledge of how to select and use appropriate new media of communications, in order to explain better the new subject content of the space age and the changes that are rapidly taking place in people, places, and events all around the world.

In addition to the traditionally accepted role of the teacher as a professional worker well prepared in subject content as well as in the psychology of learning, his new responsibility to plan efficiently and create an effective communications environment for learning must be considered.

OUR COMMUNICATIONS-CONDITIONED PUPILS

The classroom pupil today is the product of a modern communications world. Over the week end or during the preceding evening, he may have given his entire attention to television, radio, newspaper, entertainment film, comics, and slick-paper picture magazine. When this pupil enters the classroom the next morning, he brings with him vivid understandings gained through the many demands for his attention made by various communications media. Fig. 1.1 envisions his preoccupation with outside experiences as he waits for the school day to begin, regardless of whether he is in grade school or in high school.

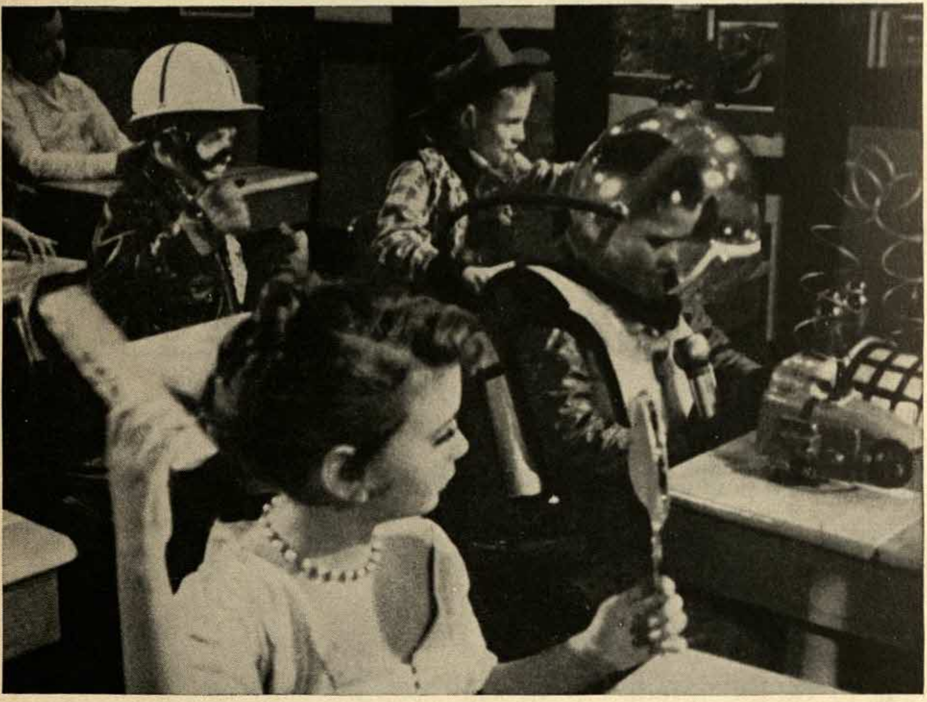

Fig. 1.1. These pupils are in costumes which visualize their preoccupation with extra-school experiences. What implications does this have for the classroom teacher to whose pupils such extra-school communications are available?

Fortunately, today's teacher realizes that this circumstance is startlingly different from that which prevailed as recently as a decade or two ago, and he is prepared to meet it. Although modern developments in the science and mechanics of communication have brought about this revolution in out-of-school communication techniques, it is the teacher's responsibility to understand the nature of these changes and then plan for the change in environment and in classroom teaching procedures which must typify learning and classroom instruction as they are currently organized. In a few short years our communication, once largely by word of mouth, has turned to mechanical types of media shown in Table 1.1.

Table 1.1. Trends in Extra-School Communications Media in the United States

	1940	1950	1960
Total households[a]	34,948,666	43,554,000	51,302,000
Total newspaper circulation[b]	39,434,000	52,270,000	57,600,000
Total magazines—weekly, monthly, quarterly, etc.[b]	7,124	7,622	9,286
Radios[a]			
Home	29,000,000	45,000,000	54,500,000
Second set in home	(no census)	(no census)	56,500,000
Automobile	7,500,000	17,000,000	41,500,000
Total television sets[a]	(no census)	8,000,000	54,000,000
Motion-picture theaters			
Roof, four walls		19,323[c]	13,500
Drive-in		3,323[d]	5,000

[a] From *World Almanac*, 1940–1961. The figure for total households for 1960 is actually for March, 1959.
[b] *Newspapers and Periodicals*, N. W. Ayers, 1940–1960.
[c] 1951 figures from *Motion Picture Production Encyclopedia*, 1952.
[d] 1951 figures from *International Motion Picture Almanac*, 1959.

According to Table 1.1, today we depend upon the daily newspaper as never before. Its almost 40 million circulation in 1940 increased to over 57 million in 1960. To this basic means of "knowledgeability" we have added more surprising and more attention-demanding graphic techniques.

The picture-story magazine has made its appearance. When we stop at any newsstand, the graphics of cover art virtually shriek for attention. As we page through any of the magazines that have high circulation figures we have the pleasurable experience of seeing things graphically portrayed in line, form, and vivid color. It is easy to account for the steady increase in the number of magazines published during the last two decades. The mod-

Fig. 1.2. In this space age, youth has become surprisingly knowledgeable. What portion of this new awareness has come from formal school programs? What from contemporary television, newspapers, magazines, and radio? In a surprisingly short time, school pupils will be receiving space broadcasts from robot telecasters. What classroom planning must be accomplished before the situation shown on these two pages is a reality?

ern magazine, with its demanding format, is a far different reader medium than the best of our current textbooks, which often seem drab in comparison.

In the United States, a radio is as much a part of contemporary living as apple pie. During the last two decades, not only has a radio become an accepted article in every household, but a great many homes now have at least two, and there is another one in the family automobile. We are a nation of three-radio households. Radio is our constant companion—in the home, at the beach, and usually in our car. Today, in spite of our preoccupation with television, radio continues to be an ever-present part of our environment as great billion-dollar networks vie for the attention of 170 million listeners who own over 150 million radios.

Twenty years ago television was not a serious enough contender on the communications scene to be included in the census count. The 1950 census, the first one to include this new medium, showed 8 million sets. In 1960, 54 million, almost one in every household, were in use. The universal use of television is limited only by the fact that a few parts of our country cannot receive television signals. This obstacle is being overcome rapidly, however, by means of community antennae. Out on the far reaches of the western plains, it is not surprising to see 300- or 400-foot antenna masts perched high

on the tops of mesas or on peaks which command hundreds or thousands of square miles. These antennae make it possible to capture direct television signals from hundreds of miles overland; the signals pass through coaxial cables to surrounding communities which were heretofore closed to television reception.

Amid these rapidly changing means of communication, the entertainment motion picture, thought to be on the way out in 1950, has surprisingly survived. Although it is true that traditional motion-picture theaters—those characterized by four walls and a roof—are diminishing somewhat in number, there were 13,500 of them in 1960. Any semblance of preoccupation with newer forms of communication which tended to cut down attendance in these theaters was more than offset by the 5000 drive-in theaters that were built. For every traditional motion-picture theater that has been closed, new outdoor drive-ins have been opened.

All the above communication media clamor for the attention of eye or ear, as witness the pull of newspapers, magazines, radio and television, motion pictures, etc. It is from this kind of extra-school communications environment that the pupil comes to the classroom. The school attempts to provide for this communications-conditioned student an orderly study of the world's social and scientific environment. Too often it finds itself relying for communication on outmoded, uninteresting, and ineffectual techniques which certainly cannot effectively compete with methods currently employed by commercial agencies. Out-of-school communications media are devised to ensnare and hold the attention of the individual, whether he be child or adult, a fact which leads all who teach, supervise, or administer schools to ask themselves these fundamental questions:

Amid the influence of current mass-communications techniques, is the voice of the school being lost?

Are today's school communications methods the best that can be devised?

Are better techniques of communication available through which the school may more efficiently communicate the socially worthwhile information in the goals it seeks to accomplish?

The school cannot afford even the possibility of losing its effectiveness in the highly efficient preoccupations created by mass-communications techniques. It is time that teachers recognize that the school must have effective means of communication if it is to be held responsible for successfully commanding the attention of school children and arranging instruction for them.

The realization of this situation makes imperative a new role for the teacher—one in which he assumes a new responsibility, namely, improving the level of classroom communications which are adapted to the needs of pupils and expressed in terms which allow them to reach recognized goals of instruction successfully.

THE TEACHER AND THE COMMUNICATION OF UNDERSTANDING

Any school classroom is a small communications world in and of itself. Within it, teacher and pupils exchange and develop ideas and understandings, a process that has been carried on for decades. During these decades, many traditions have become associated with the techniques used in classroom instruction.

The history of classroom teaching shows that verbal means have primarily been relied upon for the communication of ideas and understandings from teacher to pupil, and from pupil to teacher. This classroom communications process involves the transmitting of messages, and is helped or hindered by many conditions. The key person in controlling the nature and efficiency of this communication of ideas and understandings—in short, the efficiency of classroom communications—is the teacher. As long as these messages are transmitted unchanged or uninhibited by any interfering conditions, pupil-teacher communication proceeds efficiently.

BARRIERS TO COMMUNICATION

Experience indicates, however, that many changes occur in the messages that a teacher presents and to which pupils react. As a result, the nature of classroom learning is frequently so altered as to lower the general efficiency of instruction.

The clarity and understandability of the messages that pass between persons in a classroom depends on the absence of the ever-present but unseen barriers to effective classroom communication that arise in even the best classroom learning environments. Fig. 1.3 visualizes some of these barriers—verbalism, referent confusion, daydreaming, imperception, disinterest, and actual physical discomfort. These barriers must be understood by teachers, as well as by everyone else who seeks to communicate ideas to others.

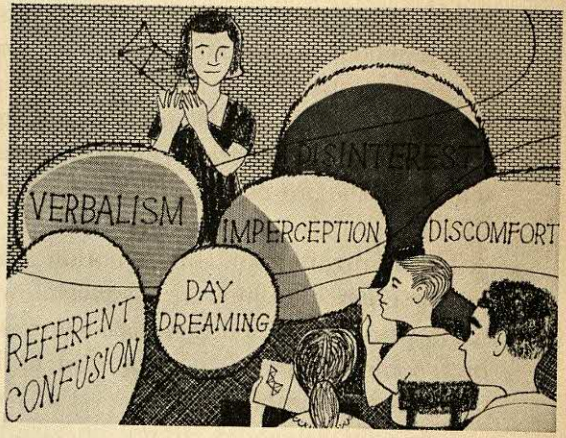

Fig. 1.3. The too-frequent communications barriers between teacher and pupil in our classrooms. To what extent are they present in your classroom? How can you remove them?

VERBALISM

Words are the substance of most classroom discussions, explanations, and questions—the means of communication through books.

Any teacher need only recall his own experience involving habitual reliance on verbal approaches to instruction to sense the unfortunate situations which may occur. The efficiency of the use of words usually declines as dependence on words alone continues. Just as muscles tire when overused, so interest and attention lag before a never-ending barrage of words. As Eliza Doolittle, the heroine of the well-known musical, *My Fair Lady,* puts it, "Words, words, words, I'm so sick of words. I get words all day through, first from him, now from you! Is that all you blighters can do?"

The interest factor alone demands that the teacher include many methods in the means of communication. This point is well illustrated by one teacher's report: "During the first five or six weeks of school, pupils listen to me; they seem very interested in my descriptions. Then comes a curious change. As week follows week and more words follow more words, interest lags, and finally even I realize that it is time for a change, a change in the methods I use to get across the ideas I so urgently seek to teach."

Never-ending dependence on mere words, which too often call forth as many interpretations as there are listeners in the classroom, is not enough.

Excessive verbalism can no longer be condoned, particularly in today's world of communications which offers much more effective substitutes from other avenues of expression. Such verbalism is a definitely limiting barrier to effective classroom communication.

REFERENT CONFUSION

The ability of two people to use the same words and arrive at completely different understandings is one of the great dangers in our classrooms.

A teacher attempts to describe an experience of his in the community in appropriate words. As these words are heard and interpreted by the pupil, the assumption is that the understanding by which the pupil interprets them is based on a background of experiences similar to those of the teacher. It is when pupils and teachers draw upon differing backgrounds of experience for interpretation that referent confusion occurs.

Referent confusion is common in reading. An author attempts to express his meaning by choosing a series of words which describe experiences he seeks to re-create. How can he be sure that the reader will have similar or even nearly similar background experiences and resulting understandings when he attempts to interpret the words the author has chosen?

Similarly, a teacher cannot be sure that the word he chooses to describe an idea or process will convey a useful meaning to every one of his thirty students, for each of their backgrounds varies and thus influences interpretation and understanding. Hence it is logical that the greater the abstractness or remoteness of a subject described by means of words, the less the similarity between the meaning the teacher intends and the understanding achieved by the pupil.

For example, on crossing the state line into Vermont, a geography teacher's son expressed great surprise at seeing forests of trees instead of the never-ending forests of chimneys which he had "learned" characterized heavily industrialized New England. A second-grader reported that she had ridden up and down on an alligator (escalator—elevator) on a field trip. And a high-school student was incensed that his grade in English was lowered because of his quotation of Poe's famous line as: "Quoth the Raven, 'Nevertheless.'" Similarly, referent confusion explains many of the myths of the social studies, such as: "All Eskimos live in snow-block igloos." The countless "boners" made by pupils are in most cases due to referent confusion.

Words alone no longer suffice as new areas of the world and breathtaking events rush into prominence—the creation of independent states in Africa, the development of new industry in the Sahara, scientific advances in the use of atomic energy, man's flight into space, etc. As will be brought out later, new techniques beyond those traditionally employed in many of our classrooms must be found if referent confusion is to be overcome.

DAYDREAMING

A common though avoidable block to efficient communication occurs when the learner daydreams, that is, when he turns away from the flow of classroom communication and dwells upon his own privately recalled understandings and experiences, which are more interesting, more exciting, and hence more preoccupying than those which are identified with classroom activities. Daydreaming interrupts a pupil's association with the stream of understandings going on in the classroom and completely thwarts planned classroom activities. An introspective "playback" of last Friday's television thriller or a weekend movie or the reconstruction of scenes from a comic magazine can completely override a pupil's attention to classroom discussion or text assignments.

In daydreaming, the strongest, the most exciting, or the most completely understood sequence of experiences crowds out the less interesting and the not so well understood. Classroom experiences that depend too consistently on verbalism may be completely rejected, with daydreaming the inevitable result. This barrier can be lessened or surmounted by increasing the understandability of classroom communication through the use of effective audio-visual classroom techniques.

Fig. 1.4. This lad is absorbed in thought. What thoughts? Those that planned instruction seeks to stimulate or those that frequently involve alternative preoccupations that have only little association with classroom learning goals?

IMPERCEPTION

The expressions "Do you see?" and "Do you understand?" are synonymous. Not by accident has the first one become part of our everyday conversation. This quality of "seeing" understanding has less to do with the psychological aspects of visual and auditory acuity than with acquiring understanding by means of the physiological functions of seeing and hearing. Most students are normal as far as sensory efficiency is concerned. However, the psychological aspects of learning from what they see and hear need to be discussed.

It is well known that appropriate training can increase to a surprising extent both visual and perceptual learning among students of similar intellectual ability and with normal visual and auditory acuity. It is possible to more than double such a pupil's ability to acquire factual information from a community resource experience, from the viewing of a film, map, or filmstrip, or from the study of a picture or display. Reading improvement programs offer a good example.

Ordinarily the eye span—i.e., how much a person "sees" instantaneously of a word, a group of words, or a line—directly affects the speed and comprehension with which he reads. Most people can train themselves to increase their visual recognition span and hence their speed of reading.

There are various ways to accomplish this. In one method which has proved effective, the pupil progressively limits the time he takes to recognize a printed word or phrase, or increases the length of the word or phrase he recognizes in a fixed interval of time. One means of controlling speed of reading for practice and improvement such as this is shown in Fig. 1.5.

What a teacher does by way of preplanning markedly affects the learning outcomes resulting from a community study or field trip. When proper listening and viewing techniques are made as much a part of the study situation as is consideration of the content, there is a notable increase in the amount of information that pupils can observe and understand.

Some of the simple means for increasing the learning outcomes derived from nonverbal experiences include classifying in orderly fashion the kinds of things seen, their shapes and sizes, their colors and textures and uses. Specific techniques which can be applied in classroom situations will be described in detail in later chapters.

DISINTEREST

Variety in classroom procedures and teaching materials usually heightens the interest and enthusiasm with which pupils approach their work. Because today's communications techniques are so varied, it is unthinkable for a teacher to wait before introducing new and equally effective techniques. In planning continuing classroom experiences in the language arts, the social studies, science, and mathematics, he can draw from a variety of instruc-

Fig. 1.5. These pupils are improving the speed with which they can respond to visual stimuli, in this case reading. With no loss to comprehension, speed of recognition can be increased. What implication does this have for the teacher?

tional materials which incorporate the best of the communications techniques currently available for classroom use and offer the greatest possibilities for communicating ideas. These include sound motion-picture films, models, specimens, filmstrips, charts, diagrams, tapes, records, transcriptions, television, and many others which will be discussed at length later in this book. Furthermore, allowing students to take part in selecting and using and interpreting modern instructional materials is a good means of overcoming disinterest that results from a paucity of teaching techniques and materials.

PHYSICAL DISCOMFORT

For decades little or no attention was given to the physical comfort of the student in the classroom. Too often the principle was, "Learning is a painful process, and some discomfort is good for the pupil."

The economic value of comfortable and efficient working conditions is made clear in our new office buildings, with their striking interior décor, their soundproofing, and their lighting systems which can be controlled in line with lighting requirements. This need for comfortable physical surroundings applies to classrooms as well as to business establishments, but only recently has it received any attention to speak of.

The modern classroom must be thought of as providing an efficient environment for learning. This environment should be characterized by light control which permits the use of projected materials, by temperature control which encourages mental activity, and by acoustical treatment which deadens reverberation and permits speaking and listening in comfort—all under the control of the classroom teacher. These are additional responsibilities to those he normally assumes, namely, content mastery and knowledge of the psychology of learning.

Classrooms everywhere are being equipped with the mechanical means of shifting instantaneously from verbal instruction to the use of audiovisual materials and methods. State colleges are constructing centers for audiovisual learning. Universities are applying the results of research in building lecture rooms designed to capitalize on the benefits of using the new communications media (Fig. 1.6).

Planning for classroom communications will be considered in detail in later chapters, and specific suggestions will be presented.

THE CHANGE IN SCHOOL POPULATION

In 1920, just after the end of World War I, almost all our children of elementary-school age were attending school. This was not the case, however, at the high-school level, for here only one youth in four was going to high school.

By the time the elementary-school child of 1920 finished grade school, the chances were that he had acquired a reasonable ability to read and write, and had learned what he could about his social and physical environment largely via the printed word. But of the youths who had finished grade school in 1920, three out of four went to work; only the fourth went on to high school. He was probably endowed with above-average intellectual curiosity. He was well trained according to the standards of the day, not en-

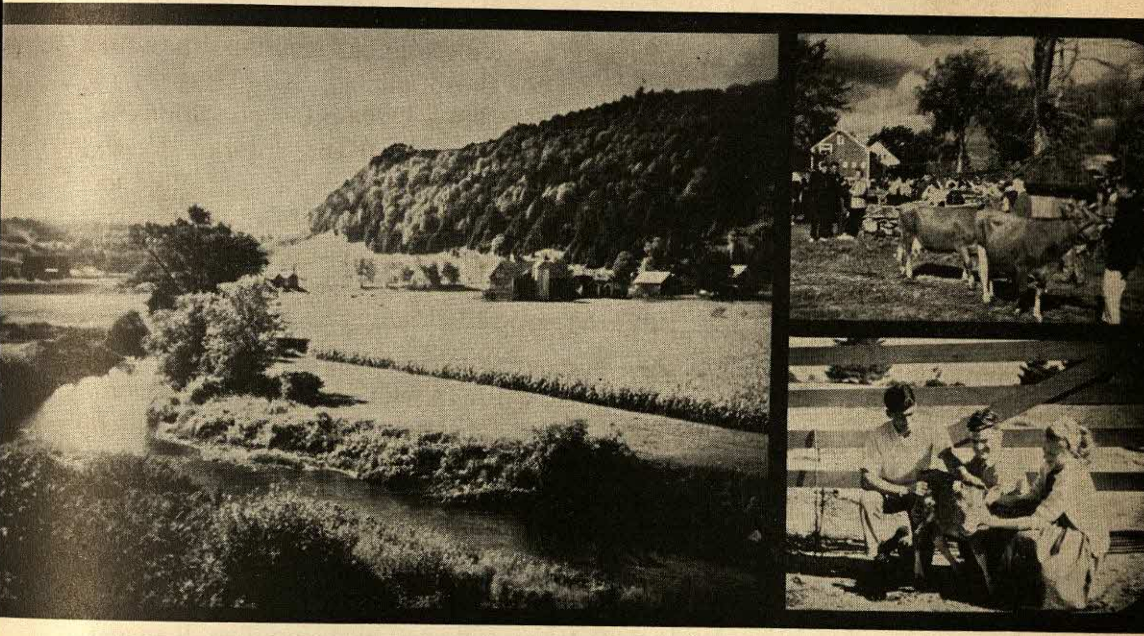

Fig. 1.6. A multiscreen projection setup similar to one at the University of Wisconsin. Before the lecture demonstration begins, hours have been spent in arranging the overall effect of the interrelated use of slides, audio tape, diagrams, motion-picture excerpts, and verbal discussion. What does this mean to the teacher who is seeking the best way in which to communicate?

tirely because of the teaching techniques then current, but more probably because he represented a selected portion of the potential high-school population.

Today, as was the case four decades ago, almost all the children of elementary-school age are enrolled in our elementary schools. But at the high-school level, 88.3 percent of youth in that age group are currently enrolled in high school (Table 1.2). The chances are that we no longer can expect the same degree of interest, intellectual curiosity, or mental discipline from this nearly 90 percent as the high-school pupils of 1920 showed.

As a result of the acknowledged lag which has always been characteristic of public education in this country, many schools today continue to be "reading schools." This is often a source of difficulty, not because learning via the printed word is bad, but rather because suitable readiness experiences which are needed to understand the words that describe today's scientific and social environment have not been provided. Too many of our schools continue

Table 1.2. Total School Enrollment in the United States[1]

	1920	1950	1960 (Estimated)
Children of elementary age, 5–13	19,992,000	22,431,000	32,548,000
Children enrolled in elementary schools	20,864,000[a]	20,714,000	30,848,000
Youth of high-school age, 14–17	7,736,000	8,351,000	11,252,000
Youth enrolled in public high schools	2,200,000	6,953,000	9,939,000
Percentage of high-school age group enrolled in high school	28%	83.3%	88.3%

[a] Higher enrollment figure due to overage children.

to rely on the teaching techniques of the 1920's which cannot compete effectively with the techniques characteristic of the communications world of the 1960's, with their emphasis on objectivity, visual presentation, and graphic portrayal. Within the brief span of the last few decades, communication has developed far beyond the traditional reading and word-of-mouth forms.

The fact that the school program has not always anticipated or met the needs of this changing school population is reflected in the number of pupils who fail to complete high school. The figures on the drop-outs, those who leave school, are in contrast to the opinion generally held concerning the effectiveness of our schools. For the nation as a whole, the percentage of pupils entering the ninth grade in 1941–1942 and graduating in 1945 was 46.7. The percentage entering the ninth grade in 1947–1948 and graduating in 1951 was 62.5.[2] Although this trend is good—62.5 percent as against 46.7—many school people are far from satisfied with the figures for the holding power of the high school in 1960, shown in Fig. 1.7.[3]

According to this figure, the holding power of the high school diminishes progressively from the freshman to the senior year. The first two years are relatively strong in this respect; however, this is not true of the junior year. By the time the student has attained the degree of maturity, initiative, and decision-making that is characteristic of the older pupil, his actions are responsible for the disturbing statistic shown. Four out of ten students enrolled at the high-school level have dropped out and fail to graduate.

The actual reasons for high-school drop-outs were first partially revealed

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[1] 1920 figures from *Biennial Survey of Education in the United States, 1944–1946,* U.S. Office of Education; 1950 and 1960 figures from *Statistical Abstract of the United States,* Bureau of the Census, 1960.

[2] *High School Retention,* Circular No. 398, U.S. Office of Education, 1954.

[3] *Statistical Abstract of the United States,* Bureau of the Census, 1960.

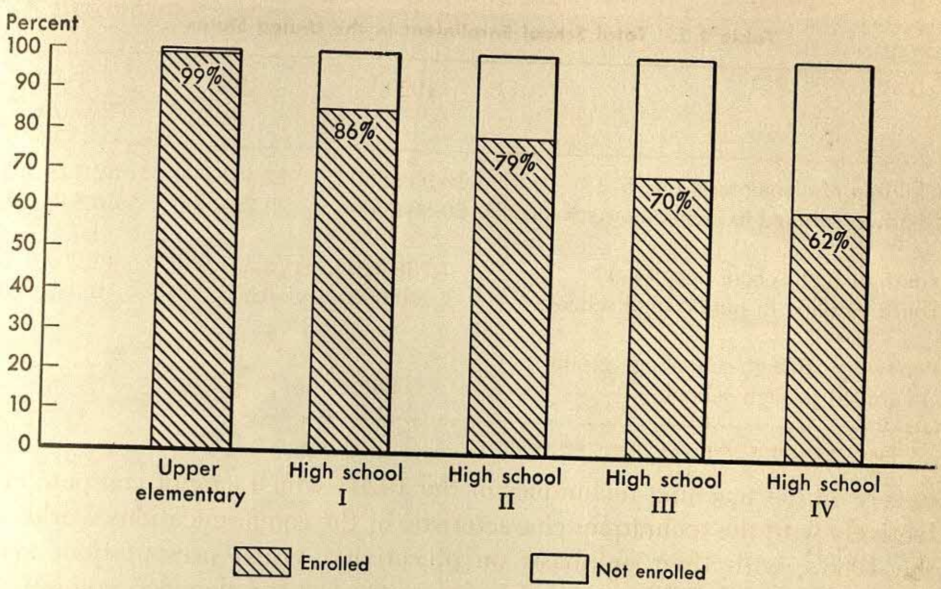

Fig. 1.7. Holding power per thousand students enrolled in upper elementary and high school, 1960.

in the study entitled *Early School Leavers.*[4] In it appears the following tabulation entitled "Reasons Given by 957 High-School-Age Youth as to First Importance in Their Decision to Leave School."

1. Reasons relating to school	
Preferred work to school	36%
Not interested in school	11%
Couldn't learn, was discouraged	7%
Was failing, didn't want to repeat	6%
Disliked a certain teacher	5%
Disliked a certain subject	3%
Could learn more out of school than in	1%
2. Financial reasons (clothes, spending money)	21%
3. Personal reasons (health, parents, friends)	10%

Seven years later, in 1956, this study was repeated by Edward S. Cook.[5] The later study shows practically identical motivations of high-school youth when it comes to staying in or leaving school. Approximately two-thirds of the withdrawals from high school reflect disinterest in school for one reason or another. Such reasons for leaving as "Disliked certain teacher," "Disliked

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[4] National Child Labor Committee, *Early School Leavers,* Dillon, New York, 1949.

[5] Edward S. Cook, "An Analysis of Factors Relating to Withdrawal from High School Prior to Graduation," *Journal of Educational Research,* 1956.

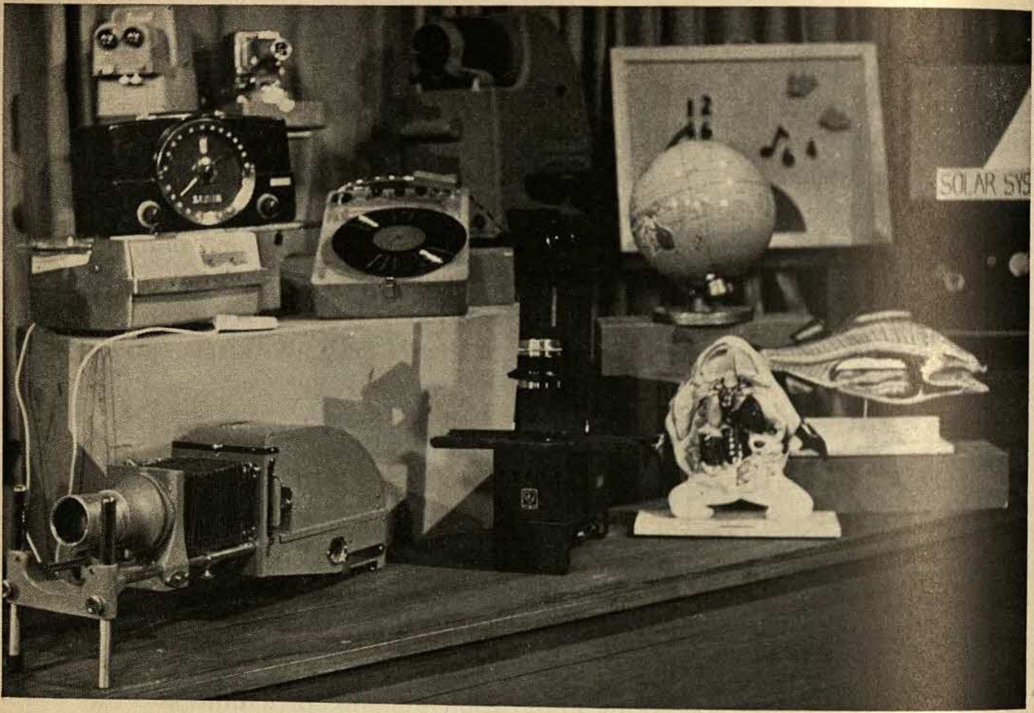

Fig. 1.8. These are some of the old and new tools of communication available to teachers today. They will be discussed as means of making the teacher a more effective agent of communication in the classroom.

certain subject," "Not interested in school," lead Cook to the generalization that failure and retardation account for 35 percent of high-school drop-outs.

The "Preferred work to school" reason indicates that of the two alternatives, school or work, work was more attractive. The reasons "Couldn't learn" and "was discouraged" are another way of saying that the school's teaching methods are not effective. We can only surmise to what extent communications failures are responsible for the attitudes motivating withdrawal from school.

These statistics point to the strong possibility that the techniques by which information, ideas, and skills are transmitted to learners need careful evaluation. There is reason to believe that the instructional methods employed today approximate too closely the traditional verbalistic techniques used after World War I. To persist in this kind of teaching is to overlook all the current techniques which characterize communications in the world of today.

There is every probability that as soon as adaptations of communications techniques characteristic of those that so successfully attract the attention of youth in out-of-school situations are brought into the classroom, school communication will be more successful and the holding power of the school will increase. Educational television, sound motion-picture films, self-tutorial devices such as teaching machines, and charts, maps, bulletin boards, slides, filmstrips, and audio materials all can serve as effective new avenues to learning. Such techniques need not replace tried and tested teaching materials; rather they supplement them (Fig. 1.8). The greatest strength of many audiovisual techniques lies in their ability to provide a useful and interesting readiness background upon which more efficient reading can be based. The result, as we shall see later, is heightened interest, a better vocabulary, and increased reading comprehension, all of them so essential to increasing the holding power of the school.

THE CHANGING CURRICULA; NEW TOOLS FOR TEACHING AND LEARNING

Today's teachers represent the last earth-bound generation. Today's pupils can look ahead to new vistas of exploration, transportation, and social intercommunication presaged by Project Mercury, the journey into space made by Astronaut Alan B. Shepard, Jr., and the other fantastic events of the space age. These events have staggering implications for the curriculum and the means by which it is taught in school.

The curriculum of the school must reflect the society it prepares youth to enter. The school's primary responsibility, to communicate an understanding of contemporary society to young people, is becoming more and more difficult.

During the International Geophysical Year, there were developed new concepts of the nature of the earth's surface, the submarine geography of the great oceans of the world, and the nature of the atmosphere and of all the zones of cosmic energy that surround it. Most important, the tremendous changes in transportation and communication have led to virtually a shrinking of our globe and to a drawing-together of all the people on it.

Simultaneously with all this, progress in all fields of human endeavor has gone forward. For example, at the turn of the century no more than 300 job classifications were listed by the federal census. The current census lists more than 4000. This directly reveals the variety and magnitude of change characteristic of man's activity today. In the midst of this great social change, we may well inquire concerning the extent of the unfortunate and damaging effects of outmoded curricula that continue to be used in the social studies, science, and language arts.

At the onset of World War II the usual elementary social studies text was concerned with peoples of European backgrounds. This very logically grew out of an analysis of our society in 1900 which revealed that most of the people in it were descendants of people who came from Europe, particularly England and the Mediterranean areas. World War II illustrated graphically how current factors can invalidate static values. The same students who were in school before that war and who methodically and laboriously read about people who came from the "type" countries of Europe were soon afterward in a world war during which they fought against and lived among people little known to them and seldom mentioned in their formal school work.

The Korean conflict and the cold war that followed World War II brought into prominence peoples heretofore practically unknown. The Red domination of China has virtually halted even the little attention previously given to the people, places, and culture of that vast country. Representation of the people of the central Congo in the United Nations has dramatically focused attention on a section of the world heretofore regarded in our social studies texts as a kind of "never-never land." Today the people of Australasia, the East Indies, India, and Indochina are achieving breathtaking reality for us as each new globe-girdling jet airliner reduces the relative distance between countries.

As these new areas of the world become politically and socially important, it is the school's responsibility to give its pupils an understanding of these people and places. Social studies can no longer be confined to Europe; they must now include the islands of the Pacific, the Malay Peninsula, and the millions of people who live in Africa, India, and the Orient. As he includes these new fields of subject matter, the teacher will find that audiovisual materials have a great contribution to make.

Old text materials in the area of general science, nature study, chemistry, and physics are being hastily rewritten. The textbooks of ten years ago made little or no mention of jet propulsion or space missiles. The textbooks of the 1940's said little if anything about heavy water or nuclear fission.

Should the old be eliminated? No. The new must be added to it.

Many of us are still using maps of the South Pacific which present that region as a vast uncharted stretch of blue water. Look at your own maps when you get back to the classroom. We know that the major battles of World War II were fought in this vast uncharted mass of blue.

Look to the north as we analyze current news items in magazines and newspapers concerning the logistics of forthcoming possible conflict. The current news magazines refer to polar distances and polar routes. How many of the maps in our classrooms are Mercator projections (oriented along the equator), a map projection which was invented by a sailing-vessel navigator over three hundred years ago when all surface navigation depended on compass direction alone? Unfortunately, this map is still in use in many of our schools, even though current orientations showing air routes over the North Pole, over Asia, or over the Pacific Ocean are desirable. Many of our traditional points of view, preserved for no other reason than tradition, must be reanalyzed.

In the case of history, we look in vain in schoolbooks for materials concerning the background of Genghis Khan, Tibet, Korea. We know little about China's history and current culture. A new and potentially powerful social order is developing in India, but what do we know about the history of that country and the millions of people whose leaders are taking a prominent place in the world today?

Rather, our study of history has been concerned with the traditional European background. This study includes ancient history, modern European history, English history, and the history of the United States.

Should we discard this emphasis? No. But let us ask ourselves what we need to add to help young learners to take their place as citizens in the world of tomorrow.

Contemporary achievements and advances in vocational crafts; technological improvements in the techniques of home economics and home management and foods; skills in intramural sports, and in individual and team games in physical education and recreation; and progress in health, in safety—no matter what area of the curriculum we examine, the trend seems to be uniform. There is more and more to know, more and more of social importance, more and more experience which the learner must be given before he can assume full and desirable social participation in the rapidly expanding world of today and tomorrow.

In the last half century the United States has become an industrial country which depends on the nations of the world. It is no longer the self-sufficient community of a century ago. It is no longer the booming laissez-faire industrial community of fifty years ago. Today it finds itself in a position involving world interrelationships to a degree which even the most liberal-minded frontier thinker at the turn of the century would not have dared anticipate.

In view of this, the curriculum is being expanded in terms of courses and subject content beyond anything that was dreamed of in the past. A half century ago the curriculum was rather rigidly prescribed around 24 subject units in the fields of grammar, Latin, mathematics, history, and rhetoric.

The *Biennial Survey of Education in the United States, 1958,* describes the composite courses offered by nearly 25,000 high schools as including nearly 1000 distinct and identifiable courses, ranging from the traditional to such new and useful ones as cold metalworking, cosmetology, commercial merchandising, electronics, and space and atomic physics, along with a host of others unknown fifty years ago.

For any one person to take each subject offered by this "contemporary high school," he would have to live for more than a century. Yet the high-school curriculum continues to expand because today there is more and more to learn. Each new technological and scientific discovery opens new vistas to curriculum development.

Obviously, the school today is finding itself with more and more subject information to teach. Of necessity the child spends more time in school. As a result, the chief instructional material, the textbook, has increased in size in terms of both pages and page size. *Even so, vast areas of our world environment are not currently included in formal education courses.*

This situation leads directly to a searching inquiry into instructional procedures, basic information techniques, the effectiveness of currently used instructional materials, and the role of the teacher with his ever-widening responsibility for ever-increasing numbers of children who are coming to him for instruction. Furthermore, the lay public is voicing a continually mounting demand that the schools train young people more adequately to take their places in a world that is more demanding, more difficult to understand, and requires more from the learner than ever before in history.

In this situation it is suggested that the teacher examine the role of audiovisual materials of instruction in terms of their ability to interest more completely the average school child today, more effectively instruct him in the educational goals that have been chosen for him to attain, and more lastingly equip him with socially desirable information that may be of use to him as he takes his place in the society of tomorrow.

THE PERSISTING TASKS OF INSTRUCTION

Among the many instructional tasks confronting the classroom teacher is that of so carefully understanding the learner's needs that, in fulfilling these needs, he can select appropriate learning experiences and use them to accomplish efficiently the sought-after goals of instruction. The effective teacher is one who understands the nature of the learner and the progress each learner has made in developing concepts and understandings necessary in the pursuit of given learning goals.

This continuing instructional task of the teacher, which is visualized in Fig. 1.9,[6] involves two basic concepts.

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[6] Adapted from G. M. Torkelson, "Teacher AV Education via Closed-Circuit Television," *Audio-Visual Communications Review*, Summer, 1958, pp. 189–199; and from Edgar Dale, *Audio-Visual Methods in Teaching*, Dryden, New York, rev. ed., 1954.

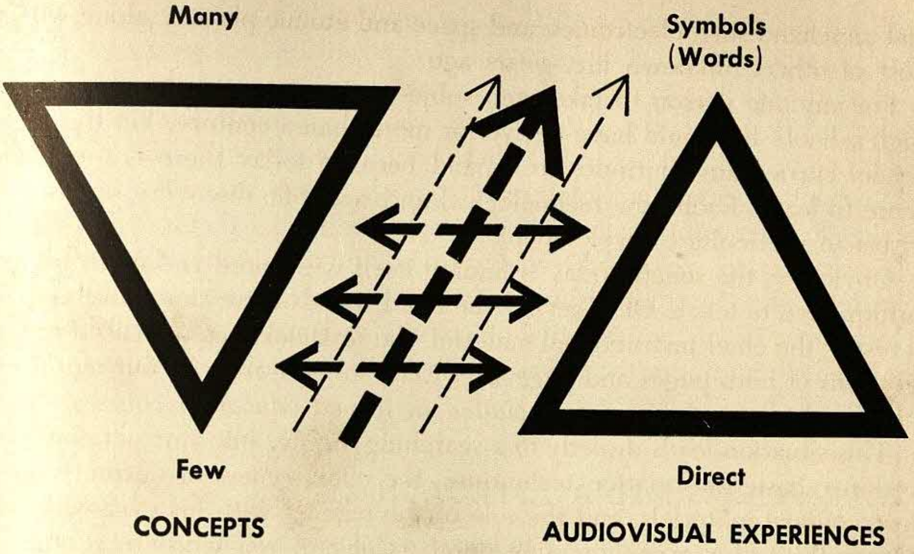

Fig. 1.9.

The first calls for understanding the present condition of the learner as measured by known concepts and understandings. The second involves the nature of various audiovisual communications materials and devices and their relationship to learning.

In any class situation, the teacher's acquaintance with the pupils will reveal those who enter the class with few very useful concepts and those whose concept and understanding inventory is fairly complete (Fig. 1.9, left). Usually the teacher is able to form an overall impression of the general level of readiness which is characteristic of the children as a group. He then knows where on the concept scale it is most advantageous to begin classroom work.

The triangle at the right in Fig. 1.9 depicts the developmental nature of audiovisual experiences. At the base of this triangle are the kinds of experience which provide the maximum opportunity for direct observation—objects, models, and specimens, for example. At the apex are the symbols, words, and other "code" kinds of communication device—abstract means of describing concepts and understandings. Between these two extremes are the other tools of audiovisual education—diagrams, graphics, audio experiences, still and motion pictures of real-life experiences, etc.—which will be dealt with specifically in later chapters of this book.

Ordinarily the teacher immediately decides that pupils who are low on the concept scale need to have a maximum of new learning opportunities presented by means of direct experiencing. So also for pupils at other places

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on this scale. In short, this relationship between known concept levels and needs in terms of direct or increasingly sophisticated learning experiences enables the teacher to help his class move steadily toward the top of both scales in Fig. 1.9. The goal is reached when pupils acquire sufficient concepts and understandings to be able to handle reflective thinking and problem solving successfully by means of symbols, words, and cues rather than having to refer continually to the direct experiences themselves.

To summarize, successful teaching usually involves determining the concept level already attained by pupils and then arranging new experiences which, because of their relative objectivity or concreteness, will build up the needed and understood concepts that are the basis for future thinking and problem solving.

THE CROSS-MEDIA APPROACH

The above explanation is likely to be an oversimplification, unless we immediately recognize that learning is complicated by the diversity of students' concept and understanding levels and the use of techniques of instruction which utilize profitable interactions that result from combinations of audiovisual experiences. Although we shall discuss the wise selection and use of each kind of audiovisual experience, we must recognize that in typical classroom situations the use of one such material is seldom efficient. *Ideally, learners should have available combinations of audiovisual experiences which reinforce one another if we are to provide the most efficient paths possible for the mastery of understandings and concepts.*

For example, in an upper-level American history class, the concept level of the pupils is likely to be quite low; and the success with which reading, which involves the handling of symbols, can impart concept understandings efficiently is likely to be correspondingly low. Here the teacher's task is to arrange a pattern of audiovisual experiences which will enhance the understanding of history concepts.

From among the many materials that are available, the teacher may ultimately select two-dimensional study prints; a collection of models, specimens, or realia representative of a certain period in history and typical of the utensils and paraphernalia actually used then; well-visualized history or time charts showing the interrelationships of time, place, and movement; and possibly a motion-picture film that enables the class to listen to the way people talked, to see how they dressed and the houses they lived in, and to observe some of the social issues and the general social background for historical action. When all of these learning experiences are used, there is an interaction that permits a maximum of learning reinforcement; this in turn usually results in the building of concepts and understandings which can be successfully related to the symbols on charts and maps and to the words in history textbooks and resource reading. In this way progress upward occurs, as is visualized in Fig. 1.9.

A teacher of elementary-grade social studies may seek a combination of audiovisual learning experiences for a unit of work that anticipates knowledge of our fiftieth state. Appropriate materials here may include a filmstrip, a tape recorder for actual verbal communication with a class in Hawaii, a 16mm. sound motion-picture film, a collection of handcraft, and a display of two-dimensional pictures and graphics.

As a final illustration, consider a science unit which is investigating space and space travel. Since text materials on this subject are usually incomplete, the teacher must gather materials from a wide variety of sources. These might include pictures and diagrams from the National Air and Space Administration, a talk by a member of the community whose experiences in some phase of space age science would be valuable; chalkboard diagrams; flat pictures; models and specimens; and a study display incorporating recent news releases and pictures. In addition, recent current events filmstrips and, if possible, a motion picture will be useful. The interaction between all of these learning materials will yield needed and useful concepts and understandings, and again the pupils will move upward in terms of Fig. 1.9.

The interrelated use of audiovisual materials just described is known as the cross-media approach. It presents many-sided opportunities for developing concepts and understandings about an area of our environment which is remote in terms of time or distance, or both. (The cross-media approach is discussed at length in Chapter 15.)

It is the goal of this book to apprise teachers of the many audiovisual materials which, if their use is carefully planned, can provide a learning environment of such nature as will enable the child to acquire increasingly valid concepts and understandings. These in turn will enable him to carry on mental activity at increasingly higher levels; for he will have to use symbols and words in solving problems now unknown but certain to face him after he has completed his formal education.

Suggested Activities

1. Arrange to visit a classroom and observe the communications techniques employed. What kinds of communications barriers are there to what, in your opinion, is the completely efficient communications environment that might exist? The ideal will be difficult to attain.

2. Compare course of study topics in current curriculum outlines with such topics in the outlines ten, twenty, thirty, and possibly forty years ago. Report your findings. (You can find these courses of study in the curriculum laboratory or in the instructional materials files of your local school system.)
3. Interview civic leaders in your community. Ask such questions as these:
   a. In your opinion, have the schools of this community changed very much since you went to school?
   b. What school experiences were most helpful to you in preparing for life in the community?
   c. What subjects did you like best? Why?
   d. How did you study history? Geography?
   e. What do you like best about today's schools?
4. Interview your fellow students and a sampling of high-school students, and ask such questions as these:
   a. How many newspaper do you read regularly? What are they?
   b. How much time do you spend each day listening to the radio?
   c. How much time do you spend watching television?
   d. How much time do you spend reading magazines?
   e. How many motion pictures do you see each month?

   What conclusions do you draw from these interviews?
5. Interview a group of elementary-school children and ask them the questions in 4a–e above. What are your conclusions as to their habits in these various fields?
6. Interview several teachers in elementary school, high school, or college, and ask them the following questions:
   a. Do you use maps and charts in classroom work?
   b. Do you use motion pictures to illustrate subject content?
   c. Do you use filmstrips?
   d. Do you use radio programs?
   e. Do you use transcriptions and recordings?
   f. Do you study community resources which relate to your subject?

   Report your findings. What are your conclusions?
7. Ask the high-school principal to help you locate the names of students who have dropped out of school during the preceding year. Arrange among yourselves to interview these students to discover:
   a. Reasons for leaving school.
   b. Attitude toward school work.
   c. Best-liked teachers.
   d. Best-liked school activities.
   e. Least-liked school activities.
   f. Things about school that could be improved.

   Following these interviews, prepare a digest of your findings and report to your class. What are the implications of your findings for Questions 6 and 7? Does any relationship exist?

8. Arrange for viewing the following films. Provide time for discussion of them.
   a. *Better Schools for Rural Wisconsin,* Sound, Color, 29 min., Univ. of Wis., Bur. Aud.-Vis. Instr.
   b. *Fight for Better Schools,* Sound, B&W, 22 min., March of Time.
   c. *Mike Makes His Mark,* Sound, Color, 29 min., NEA.
   d. *Problem of Pupil Adjustment,* Part 1, *The Drop-Out;* Part 2, *The Stay-In,* each B&W, 19 min., McGraw-Hill.
   e. *Secure the Blessings,* Sound, B&W, 30 min., NEA.
   f. *To Speak with Friends,* Sound, B&W, 28 min., NEA.

Bibliography

American Association of School Administrators, *Educating for American Citizenship,* 1954 Yearbook, National Education Association, 1954.

Barnouw, Erik, *Mass Communication,* Rinehart, 1956.

Bereday, Z. F. George, and Lauwerys, A. Joseph, *Communication Media and the School,* World Book, 1960.

Brown, J. W., Lewis, R. B., and Harcleroad, F. F., *Audio-Visual Instruction,* McGraw-Hill, 1959.

Dale, Edgar, *Audio-Visual Methods in Teaching,* Dryden, rev. ed., 1954.

Harcleroad, F. F., and Allen, William, *Audio-Visual Administration,* William C. Brown, 1951.

Henry, Nelson B., *Audio-Visual Materials of Instruction,* 48th Yearbook, National for the Study of Education, Part 2, 1954.

Henry, Nelson B., *Mass Media and Education,* 53rd Yearbook, National Society Society for the Study of Education, Part 1, 1949.

Johnson, Clifton, *Old Time Schools and School Books,* Macmillan, 1925.

Kinder, James, *Audio-Visual Materials and Techniques,* American Book, 2nd ed., 1959.

Kinder, James, and McCluskey, F. Dean, *The Audio-Visual Reader,* William C. Brown, 1954.

Lazarsfield, P. F., and Stanton, Frank N. (eds.), *Communication Research (1948–49),* Duell, Sloan & Pearce, 1950.

Miller, Neal E., *Graphic Communication and the Crisis in Education,* Department of Audio-Visual Instruction of the NEA, 1957.

National Child Labor Committee, *Early School Leavers,* Dillon, 1949.

Rufsvold, Margaret I., *Audio-Visual School Library Service,* American Library Association, 1949.

Schramm, Wilbur, *The Process and Effects of Mass Communication,* Univ. of Illinois Press, 2nd ed., 1954.

Thomas, R. Murray, and Swartout, Sherwin G., *Integrated Teaching Materials,* Longmans, Green, 1960.

CHAPTER 2

HOW PEOPLE LEARN

How often we unthinkingly imitate teaching methods that we experienced when we were pupils, only to realize their inefficiency later. Imagine that we are looking in on a teachers' meeting that is evaluating some of the methods still used in teaching.

Chairman. I'd like to investigate the efficiency of some of the methods many of us employ in classroom teaching. To do this, we'll do some role playing. Will you members of the teaching staff make believe for the next five minutes that you are back in a social studies group in the upper grades?

Teachers. Yes.

Chairman. Good. . . . We're going to begin a new unit about American inventors. Will each of you recall the names of some great American inventors? I'll write down your suggestions.

(*Teachers volunteer names.*)

Chairman (*writes names and number of mentions on the chalkboard*). All right, we have Edison 2, McCormick 2, Whitney 4, Fulton 1, Bell 2. . . . Obviously to most of you Whitney is an outstanding inventor, so we'll begin our study with him.

What do you already know about Eli Whitney? Think about this. I'll ask each of you for your ideas. (*Chairman asks each teacher and tallies all the answers.*) . . . Here's the result:

Eli Whitney invented the cotton gin—12 responses; Eli Whitney formulated the principles underlying mass production—2 responses.

Practically all of you know Eli Whitney primarily as the inventor of the cotton gin. Let's investigate a little more carefully this "lesson" all of you learned so well about Whitney's cotton gin.

To do this, close your eyes, and *keep them closed!* Now indicate with your hands the size of Whitney's cotton gin. But keep your eyes closed! . . . Keep your hands exactly as far apart as you have them. Now open your eyes and compare your idea of size with the others'.

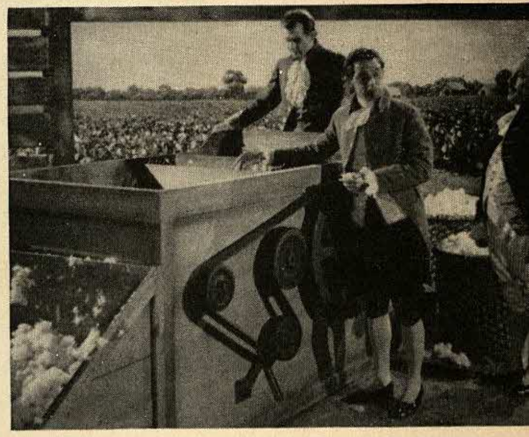

Fig. 2.1. This reconstruction of Eli Whitney's cotton gin reflects careful and authoritative historical research. How does it compare with your own mental image?

(*The teachers open their eyes and look around them. They see a wide variety of sizes—the smallest cotton gin is about a foot wide, another is about two feet high; one is so big that the teacher's arms aren't long enough to convey its size.*)

Chairman. Fine, thank you. Now we'll see a two-minute excerpt from a film[1] showing an actual reconstruction of Eli Whitney's cotton gin [Fig. 2.1]. (*Shows film. According to it, the cotton gin was about 15 feet by 4 feet by 4 feet.*) Now let's consider the implications of this experiment. What are your reactions?

Teacher 1. Most of us were way off.

Chairman. You all studied about Eli Whitney's cotton gin in grade school, later in high-school history, and perhaps even later in college classes in American history. If you'd *really* learned about it, you should have had a fairly good memory of its size.

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[1] *Eli Whitney,* Sound, B&W, 18 min., EBF.

TEACHER 2. But we never had a chance to really visualize it.

CHAIRMAN. What information sources did you recall just now when you were asked to indicate the size of the cotton gin?

TEACHER 1. Well, I remember reading about Eli Whitney, but my idea of the size of the cotton gin was way off.

TEACHER 3. I saw a drawing of it, but apparently I got a wrong impression.

TEACHER 4. Perhaps that picture contained nothing that you could use as a basis for an idea of size. Or perhaps the picture showed a model.

(*The discussion continues on the relationship of learning that stems solely from verbal impressions. Such learning is often incapable of imparting an accurately remembered image of a concrete thing—in this case, Eli Whitney's cotton gin.*)

CHAIRMAN. The point I want to make is this: You saw how inaccurate your remembered understandings were of a concrete thing like Eli Whitney's cotton gin. What inaccuracies do you imagine our students' minds pick up when we use similar traditional verbal approaches to understanding such abstract ideas as the social reasons for opening up the West, the events that led to the founding of the United Nations, or the "triggering" of the reaction in a critical mass of fissionable materials?

Getting back to Whitney, why did only two of you remember him for his major contribution to our country's social and economic progress, the formulation of mass-production principles?

Teachers are not the only ones who witness the inadequacies of too great reliance on traditional verbal approaches to learning goals. Anyone who participates in communications, formal or informal, is faced with similar problems.

A good example of this among specialists in communications occurred when the editors of *Parade* asked three expert staff artist-illustrators, who made their living by visualizing ideas, to draw an animal.

We asked them to draw an animal described by that very complete authority, the *Encyclopædia Britannica:*

"The body is stout, with arched back; the limbs are short and stout, armed with strong, blunt claws; the ears long; and the tail thick at the base and tapering gradually. The elongated head is set on a short thick neck, and at the extremity of the snout is a disc in which the nostrils open. The mouth is small and tubular, furnished with a long extensile tongue. A large individual measured 6 ft., 8 in. In colour it is pale sandy or yellow, the hair being scanty and allowing the skin to show."[2]

Our artists' rather befuddled efforts are shown [in Fig. 2.2].[3]

Comparison with a picture of an aard-vark, the animal described above, indicates how diverse were the impressions conveyed by the verbal descrip-

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[2] See aard-vark, in *Encyclopædia Britannica*, Senior Volume I, p. 4.

[3] *Printer's Ink*, April 1, 1949.

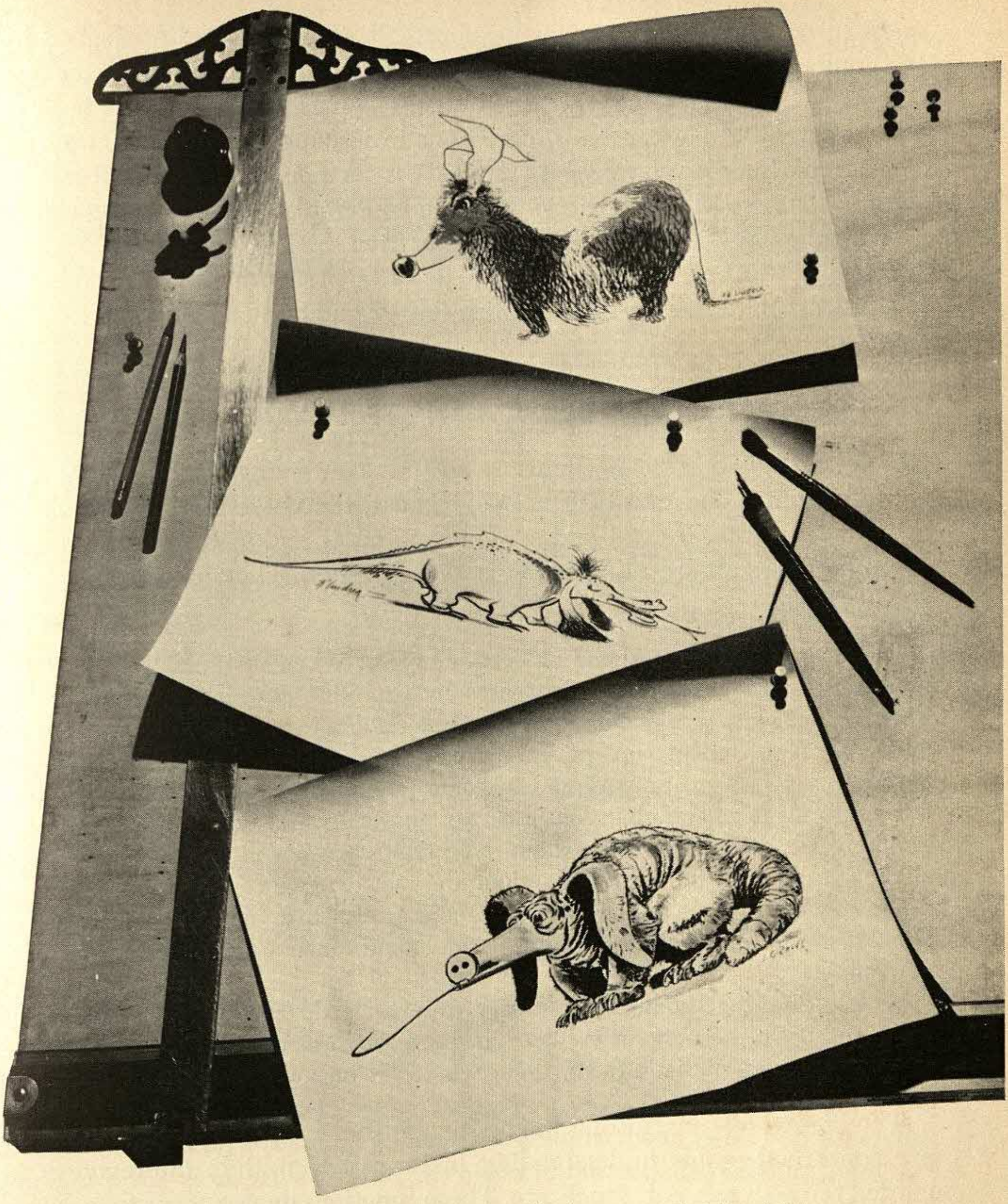

Fig. 2.2. These three drawings were inspired by the same verbal description.

tion. Notice how the three artists visualized the phrase "arched back." Observe their graphic interpretations of the "extensile tongue," and of "the hair being scanty and allowing the skin to show."

Obviously the meaning given these words was related to varied individual experiences. None of the men had seen an aard-vark. They had seen other animals, however. To one man the phrase "hair being scanty" recalled his previous acquaintance with elephants. To another this same phrase recalled an encounter with an opossum. Since the meanings varied with the individual's experiential backgrounds, variations in visualizations occurred.

Learning is a complex process. To discuss such an important process in a short space is to place restrictions on the contemplation of learning principles about which volumes have been written.

It is the purpose of this discussion to describe basic principles of the learning process in terms of their application to audiovisual experience.

PERCEPTION—FOUNDATION OF LEARNING

Our perceptor sensory mechanisms are our continuing contacts with our world of things and events. The eye, the ear, the nerve endings which respond to pressure, to heat and cold, and to odors and tastes are the means through which almost all learning is accomplished. They are the means of perception.

> In perception we apprehend objects or events. When we perceive, we translate impressions made upon our senses by stimuli from our environment into awareness of objects or events. . . . The objects and events of which we become aware are regarded in perception as present and as going on. This activity of perceiving is such a universal and intimate feature of our mental life that it is often difficult to realize that objects of the physical world do not merely present themselves and that we do anything more than open our minds to receive them as they really are. It is easy to overlook the fact that we construct our world of things and events out of our sensory processes and that physical objects as we know them through sight, sound, taste, smell, and touch are products of our own perceptions. . . .
>
> Widely differing qualities of sensory experience depend upon the organs of sense and upon the nervous system. They are the basis of our knowledge of the world about us. Without them, there would be no awareness of anything.[4]

The normal learner, insofar as the functions of his perceptor mechanisms are concerned, gains understanding in terms of multiple impressions recorded through eye, ear, touch, etc. These functions do not occur in isolation but rather through a blended pattern from any or all of the perceptor mechanisms that are stimulated by external occurrences.

Effective perception is thus a blending of sensations which then gives rise to thoughtful shuffling, arranging, and selection of a pattern. This pattern

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[4] Howard L. Kingsley, *The Nature and Conditions of Learning*, Prentice-Hall, New York, 1947, p. 262.

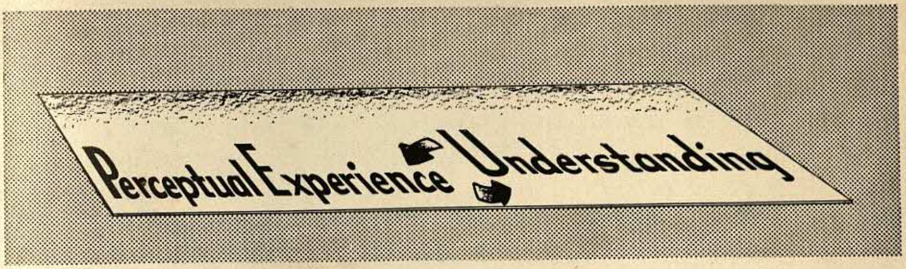

Fig. 2.3. Understandings emerge from experiences.

may be thought of as an understanding of an event or object. The process may be visualized as shown in Fig. 2.3.

PERCEPTION—BASIS OF THINKING

Adults, of course, are better thinkers than children, for the latter are guided in their thought by literal applications or limited applications of perceived experience. In thinking, the learner is limited by the number, variety, and scope of perceptions already experienced. Thus the learner who has it within his ability to draw upon a wide variety of background experiences which he can recall at will is apt to be more effective in his thinking than the learner who does not have this broad background.

During the thinking process the learner is ordinarily confronted by a problem to be solved. If the problem is clearly understood, if it is interesting and challenging to the learner, if it is not so difficult as to discourage him, he will begin to search for and select appropriate understandings which may apply to the ultimate solution of the problem. He will be able to *recall* understandings, or he may have to search for new information through *new perception*—reading, interviews, observation, and examination. Soon he will choose an answer, or, failing to do this, he will give up and leave the task unfinished.

What actually happens in such a thinking process may be illustrated by a second-grade child's search for understanding of how wool is grown and made into the cloth out of which his own clothing is cut. (See Fig. 2.4.)

In the intermediate grades children study the story of wool and woolen textile manufacture. Few children approach this study with much more than a superficial experience with wool.

A child may touch the woolen fabric of his clothing and get experience with texture. He may observe the fact that the cloth, first seen as a gross mass, is made up of tiny threads. On pulling one of these threads apart, he can see the minute but single strands of wool. His interest may be aroused.

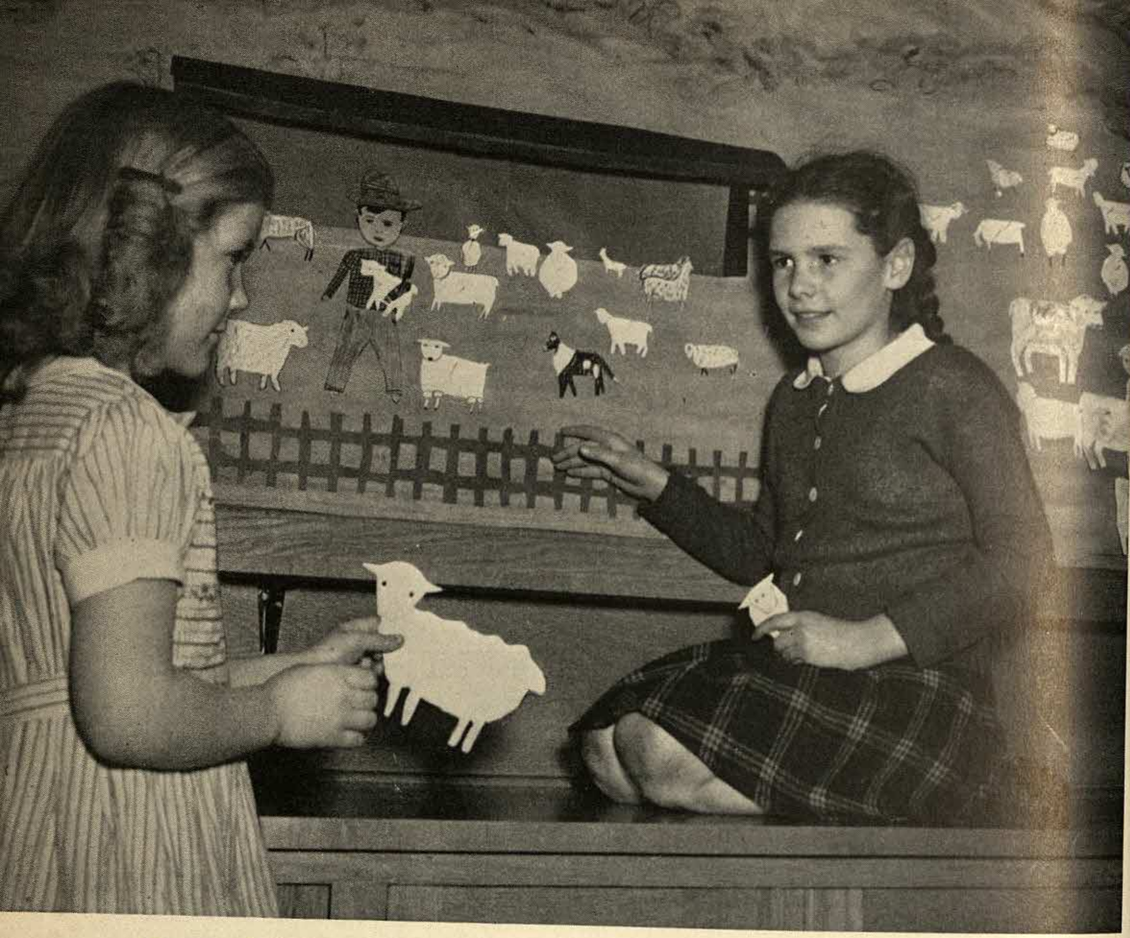

Fig. 2.4. Concrete experiences with wool help these learners to develop understandings.

Immediate understandings of color and texture, even a superficial understanding of what weaving means, have been gained through firsthand perception. Questions come to mind. How are the various colors added? What is the relationship of the single fiber to the little bundle of fibers which make up the thread?

To answer these the child begins searching through his own past experiences with woolen fabrics. He may recall none; but if he is interested, he will respond to his own need or to his teacher's suggestions that he gain further experience with wool.

What avenues are available to him?

He may read. But as he reads, he will find that he is taken farther and farther afield from firsthand experience. In trying to understand such words as "Australia," "sheep ranch," "wool exchange," "warp," "woof," "shuttle," "shears," and a host of other new symbols with which he may or may not have associated understandings, he may become more bewildered than challenged.

At this point he must have opportunities for additional real experience or perception. A visit to a farm to watch sheep being sheared or to a factory in which woolen things are fabricated would be valuable. Someone from the community might be invited to the classroom to demonstrate the hand carding, spinning, and weaving of wool, and at the same time answer questions the children ask. A museum might be visited.

The child whose curiosity has been aroused will respond enthusiastically to perceptual experiences. In this case additional experiences with wool will help him achieve varied understandings of the processes involved with wool and will allow him to draw conclusions as the result of his continued thinking about wool. If children do not get the new experience that is needed, incomplete or half learning will result.

Usually the difficulties of thinking and problem solving mount as the problem to be solved concerns things that are increasingly remote from opportunities for firsthand experiencing. The middle-grade child who is trying to gain an understanding of life in some remote area of the world is faced with greater barriers than is the child who wants to know more about plant life in the family garden.

Consider the learning problem of the child who attempts to understand life on the desert. He is told that people who live in desert countries live in "barren areas." He may be asked to describe "a sandstorm."

What understandings does the child who lives in our Middle West have which will help him to describe a desert sandstorm? His immediate perceptions may include the sensation of a grain of sand in his eye. A trip to the beach may have acquainted him with the feeling of sand on his arms and legs. He may have experienced high wind. Yet these dissociated experiences may not parallel very closely the sensations he would have if he were in the rocky, barren south slopes of the Atlas Mountains, standing in the swirling, dry topsoil which infiltrates everything as a 70-mile-an-hour wind whips relentlessly across the surface of the land.

The thinking teacher will sense the child's need for further experiential backgrounds. Obviously the most effective thing would be to transport the children to the desert, to the south slopes of the Atlas range. This, of course, is impossible. The next best thing is to contrive experiences. A feeling for the locale might be achieved through the construction of a model. Carefully selected photographs, both black and white and colored, would help as they were examined and discussed. An authentic sound motion-picture document about life in this desert region would add understanding. By contriving visual and auditory impressions of environmental situations it is possible

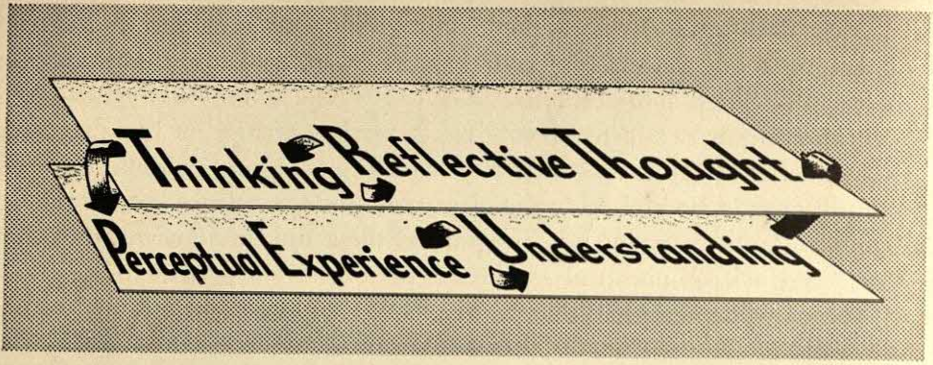

Fig. 2.5. Understandings become the basis for thinking.

to supply "real" or concrete experiences upon whose basis a more accurate understanding may be gained of life in an open desert. *From these understandings, the sorting, associating, discarding processes of thinking may then proceed.* The process may be visualized as in Fig. 2.5.

The orderly process of thinking involves the selection of the understandings which apply, and the discarding of those which do not apply, in the solution of a problem. The basis for thinking is a body of understandings from among which selection may be made. Understandings are the outcomes of perceptual or real experiences with events or things. Thus the basis for thinking is a broad background of perceptual experiences.

In a complex world environment where the learner is often unable to have had a wide range of personal perceptual experience, audiovisual materials may be useful in simulating many desirable and needed perceptual experiences.

PERCEPTION—BASIS OF ATTITUDE FORMATION

What is an attitude?

Many descriptions of attitudes might be quoted. One which serves our purpose well has been voiced by Gordon W. Allport: "An attitude is a mental and neural state of readiness, organized through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related."[5]

How may this definition be applied to the question of how children form attitudes toward frontiersmen or pioneers? Attitude formation may start during conversations around the dinner table as children listen to parental views. A scoffing remark about the Thanksgiving Day celebration may lastingly influence one's regard for pioneers. The feelings the parent expresses as he speaks about Thanksgiving and the pioneers may later arouse or deaden the child's desire to investigate American history. A child's awareness of the idea of "frontiersmen" or "pioneers" may spring from purely emotional experience gained in home conversations about the subject.

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[5] Gordon W. Allport, "Attitudes," *A Handbook of Social Psychology,* Clark Univ. Press, Worcester, 1935, p. 810.

At school, on the other hand, "the pioneer idea" will most likely be studied in connection with concrete and verbal experience. During this study, meanings, associations, and the attitude ultimately adopted may change drastically.

Classroom study situations can create understandings about pioneer life through realistic and concrete experiences. Concrete experiences may include models of pioneer villages, and trips to the museum to examine pioneer home construction, costumes, utensils, and other things related to frontier living. A well-planned bulletin board with illustrations can help visualize pioneer life. A motion-picture film can reveal a reconstructed frontier village complete with people who talk in the pioneer way of speaking. These added experiences and understandings can alter a pupil's original attitude or create an entirely new one.

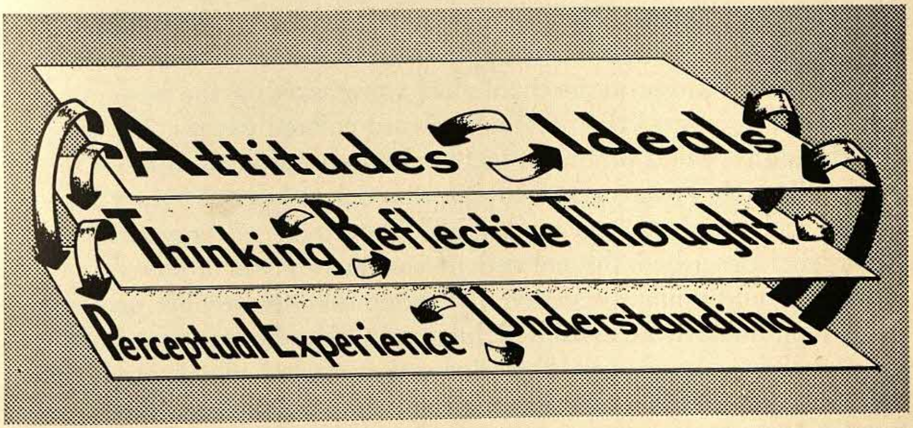

Fig. 2.6. Reflective thinking rather than emotion is a more hopeful basis for the attitudes we develop.

On the basis of such learning opportunities, a pupil can compare life today with frontier living a century ago. The understandings he selects from his experience, and the associations he builds in attempting to understand living conditions *then* and *now* will ultimately modify his whole "feel" or attitude toward the pioneers who opened the West. The child of today may gradually begin to associate the life of the pioneer with democratic purposes. Attitudes based on imitation or emotion give way to those which the learner himself forms on the basis of his new concrete experiences, understandings, and thinking.

The diagrammatic representation in Fig. 2.6 shows the multidirectional relationship between attitudes, thinking, recalled perception, and concrete experiential backgrounds. Although the diagram shows three levels—perceptual, thinking, and attitudinal development—all are endlessly intermeshed and interrelated.

THE INTERRELATED PROCESSES IN LEARNING

As a young learner attacks a problem through thinking, he may be influenced by an attitude of mind that is well established, if only on an emotional basis. He will probably begin to search for additional understandings. He may gain these through interviews, through reading, through discussion, or through concrete experiencing. If he is an orderly thinker, he will then select the data that fit his purpose and apply them in the solution of his problem.

Members of a junior-high-school class were asked at the beginning of a unit of work to express their feelings toward colored people. The predominant attitude revealed that most of the children felt very superior to these people. When they were asked to describe colored people, their responses included such words as "not too bright," "entertainers," "servants." Most of the students described the colored person in terms of a stereotype.

Following additional discussion, the group admitted that it needed more information. Books were consulted, biographical accounts about famous colored people were read, two filmstrips were selected which visualized the similarities and dissimilarities among the peoples of the world, and several carefully selected sound films were shown which transported the audience into parts of the world where colored people live.

The stereotype idea was soon exploded. Even casual examination of the film material revealed startling anthropological differences among colored people.

Photographs of Negro architecture were studied. Specimens of handcraft, sculpture, carving, and art were examined. Students who previously had been very dogmatic in their assertions showed evidences of doubt about some previously held beliefs. Carefully planned classroom procedure had begun to modify the imitated or emotional attitudes of the students.

In another situation a group of tenth-grade pupils studying economic geography expressed great surprise when told that the highest per capita development of hydroelectric power was not in the United States but in

Switzerland. The preconceived attitude that Americans are superior was so firmly ingrained in the minds of this group that actually seeing a sound motion-picture film which showed many electric ranges, electric lights, and radios even in the most remote Swiss chalets *was not sufficient to alter this original attitude in many of the students.* Further discussion, further reading, further reference to simulated experiences were required to alter the prejudice of the group.

In another group of upper-intermediate-grade children the attitude that people who live far away must therefore be very unlike them was held so completely that they at first failed to accept some of the obvious similarities which exist. During a study of the people of Chile, the similarities between the San Joaquin valley of California and the fertile central valley of Chile were being discussed. Even in the face of this, these twelve- and thirteen-year-old children held a persisting attitude of "foreignness" toward Chileans. After having seen a 16mm. sound film which showed women in Chilean households preparing the noon meal and cutting such vegetables as carrots, peas, beans, and others familiar to every class member, most of the group were unable to identify the vegetables. To them the obvious was "too simple." It just could not be that people who lived 4000 miles away cultivated and ate some of the same vegetables that are raised in the United States. However, further discussion and additional showings of the film dispelled the false impressions.

In the classroom the teacher has an opportunity to approach the problem of modifying, influencing, and actually building socially desirable attitudes. That this can be accomplished through carefully planned learning situations has been brought out. Attitudes can be formed or at least modified. By supplying positive and graphic opportunities for understanding, a reservoir of readiness can be established. This background of "learned" understandings may allow for thoughtful sorting, arranging, and testing. Thus real "experience" is perhaps the classroom's most hopeful avenue through which we can help influence children as they think their way toward socially desirable attitudes and patterns of future action. Through these carefully planned classroom learning opportunities we can more effectively provide students with materials for discriminating thinking when they deal with the problems of living and acting in both the present and the future.

This is the high social purpose of education.

Effective instructional techniques depend greatly upon providing young learners with wide varieties of participatory experiences. When children begin their school life they have the opportunity of examining the world about them through direct observation. They may take field trips in the community. They may visit the water plant, the post office, the corner grocery store. They may engage in conversation with the people who operate local industries. All this very effective learning is accomplished through seeing, hearing, feeling, manipulating, and examining. It is nature's own way of learning—by seeing and hearing simultaneously, by becoming "aware" through the interdependent functioning of these two primary sensory receptor mechanisms, the eye and the ear. Through concrete, firsthand impressions young children become familiar with the world about them.

UNDERSTANDING IN READING

We soon recognize that among average children in the first grade those who have many firsthand experiences often make most progress in learning to read. As these first-graders begin to read, they read about things they have experienced. The words they see soon become associated with these experiences. The child discovers he is able to gain comprehension in reading because he associates more and more experiences with the symbols which stand for them.

Thus it is important to supply the child with firsthand experiences which far exceed the numbers of literal symbols that he is attempting to understand or comprehend. The symbols which he attempts to interpret might as well be German, French, English, or Sanskrit. It would make little difference. The important thing for the teacher to remember is that experiences must precede the abstract symbol which the child is attempting to understand. A first-grade teacher expressed it this way: "I know better than to place a book in the hands of a beginning reader and say, 'Turn the pages, boys and girls. We will begin to read.' Rather than this, I first take weeks and even months to arrange many kinds of firsthand experiences for the child. Out of these experiences, understandings are gained. We talk about these understandings; we act out little plays about them. They become the subject of our day-to-day conversation, and only after this do we turn to the printed page and attempt to relate understandings to the symbols which appear on these pages."

The importance of suitable readiness experiences in learning to read may be illustrated by observing the difficulties and successes of children as they read.

Some processes of reading are very complex. It may be wise, therefore, to recall your own experiences with reading by placing yourself once again in the position of the beginning reader. As you try to capture some of the feelings of the first-grade child when he confronts the alphabet and reading, the following may be helpful:

Imagine that this is your first contact with a new alphabet, or at least a new version of a familiar one. Study the following alphabet for not more than a minute or two.

aɪ	(as in aisle)	aɪl	e	(as in data)	de̱tə
ɑ	(as in calm)	kɑm	ə	(as in data)	detə̱
aʊ	(as in now)	naʊ	i	(as in unique)	unik
ʊ	(as in put)	pʊt	ɪ	(as in in)	ɪn
u	(as in true)	tru	j	(as in your)	jur
ʌ	(as in cup)	kʌp	ð	(as in these)	ðiz

Now as a beginning reader might, go directly to reading this "primer level" story. As you try out your ability to read meaning from the following visual symbols, take note of the number of times you need to refer to the "alphabet." The chances are that even repeated reference to this alphabet did not help you to understand or comprehend. What new or additional clues are needed?

aʊr stʌdɪ ʌv wʊl

wi kom ðə wʊl.
wi juz kardz tu kom ðə wʊl.
wi kom ðə wʊl tu mek jɑrn.
wi mek jarn aʊt ʌv komd wʊl.

As you read this story, did you make sense out of the words you "spoke"? Did you stumble, repeat, refer to the alphabet, or become annoyed as a child might?

The experience in which you have just now engaged might closely parallel that which a beginning reader would face as he attempts to gain meaning from abstractions—words. He, like you, would seek appropriate familiar conceptions which could fit logically the sounds which are related to the symbols. If this could be done, he would seek to associate the sounds with words already known to him as oral experiences.

The chain of thought might be completely blocked, however, if at the onset he had no clues to the general nature of the situation being described through the medium of the printed word or symbol. This situation is well known to the teacher of beginning readers as he or she invariably plans to introduce helpful clue suggestions in the form of verbal hints, references to objects visible in the classroom, or appropriate drawings or pictures.

In the case of the above illustration, an appropriate clue has been provided in the form of a related picture. In order to judge the effectiveness of such a clue, turn the page and proceed.

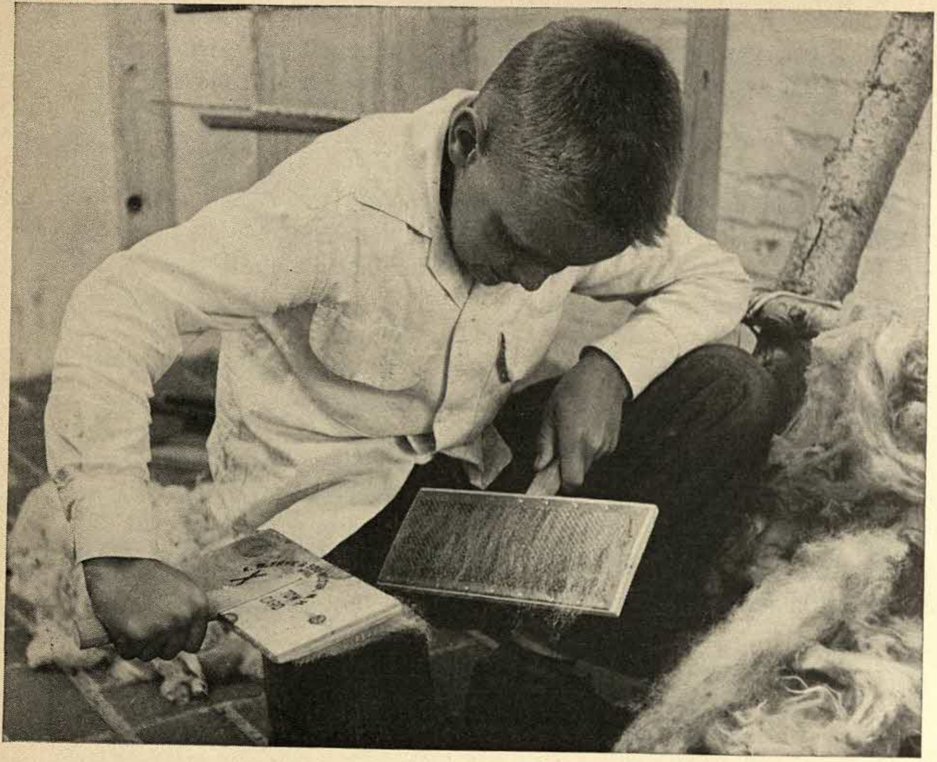

Fig. 2.7.

Study the picture. Examine it carefully. Ask yourself what meanings it reveals. Now read the primer story under the picture.

aʊr stʌdi ʌv wʊl

wi kom ðə wʊl.
wi juz kardz tu kom ðə wʊl.
wi kom ðə wʊl tu mek jɑrn.
wi mek jɑrn aʊt ʌv komd wʊl.

No doubt, you read more successfully because of understandings gained from the picture. As the meanings of the picture became available to you, you applied them to words in the story which related to them. Thus, you discover that readiness experiences which precede reading, per se, provide clues to reading and to the process of attaching appropriate meaning to words. Whether the words are in English, phonetic symbols, or Sanskrit actually makes little difference.

The second illustration of the need for understandable readiness experiences is readily available in the *Thorndike-Barnhart Beginning Dictionary*.[6]

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[6] *Thorndike-Barnhart Beginning Dictionary*, Scott, Foresman and Company, Chicago, 1952.

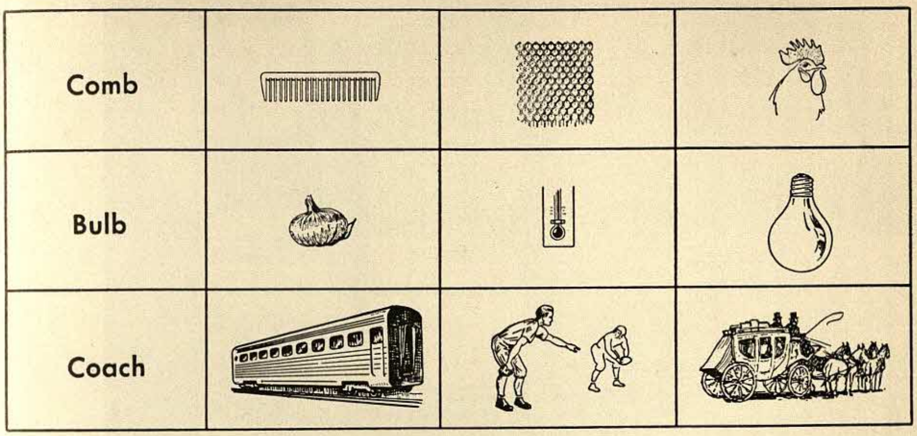

Fig. 2.8.

Fig. 2.8 shows how this dictionary quickly and clearly explains the several meanings of single words. In Fig. 2.9 we see how the high-school version of this dictionary[7] conveys in a concise and clear-cut manner the meaning of some unusual words for which learners may well not have appropriate background readiness experiences. The use of pictures to establish understandings of things we read about is an integral part of the reading process.

Pictures, however, provide only one approach to reading readiness and

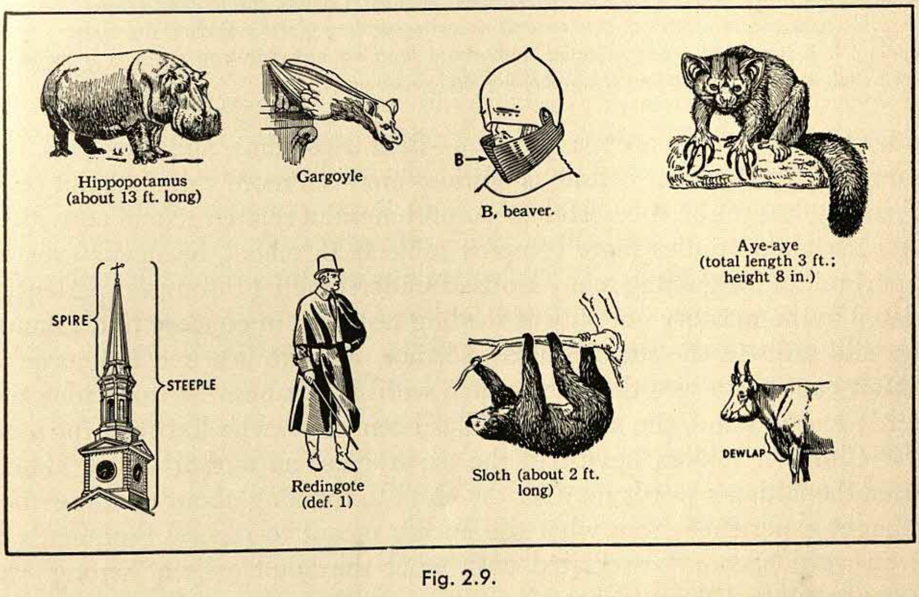

Fig. 2.9.

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[7] *Thorndike-Barnhart High-School Dictionary,* Scott, Foresman and Company, Chicago, 1952.

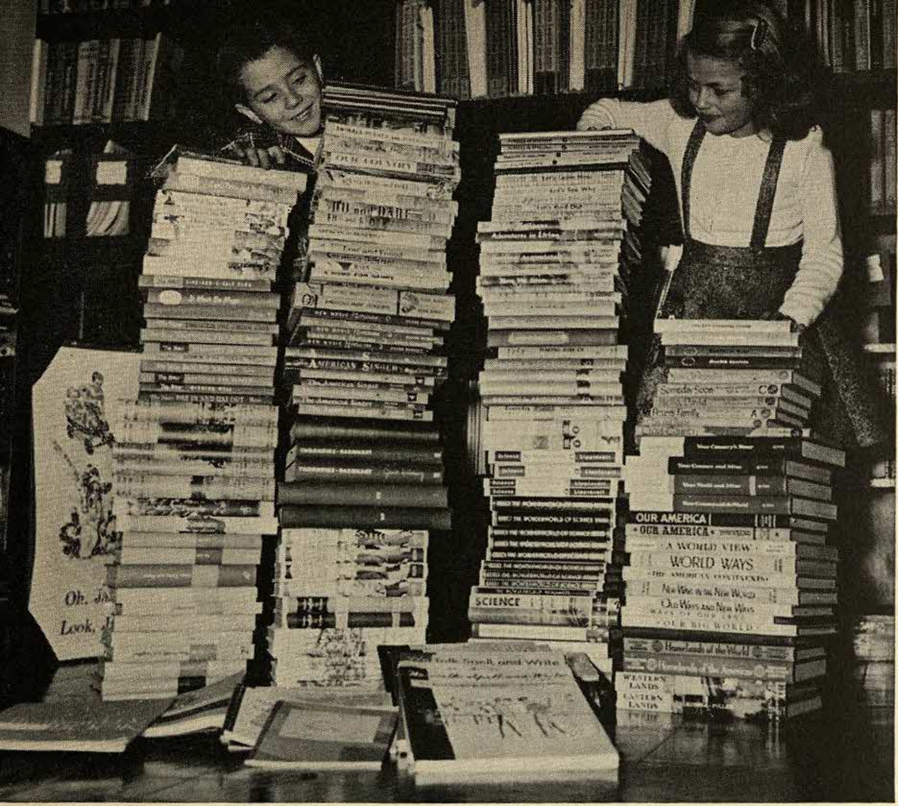


Fig. 2.10. These are the basic textbooks only, not library and resource books, which an elementary-school child is expected to read with comprehension as he goes from first to eighth grade. Authors use words to stand for experiences they describe in books. The teacher's responsibility is to provide experiences which will give readers an understanding useful in finding the author's word meaning. It is here that wisely selected audiovisual learning materials can make a tremendous contribution to success in reading comprehension and vocabulary.

understanding. There are many others—field trips, films, and filmstrips, for example—which under certain conditions are even more valuable, not only to reading but to the successful accomplishment of related school activities.

As the child studies more complex subjects in school, he needs greater opportunities for gaining many kinds of understanding through experiences related to the mastery not only of reading tasks but of concept understandings and skills in the social studies, science, creative art, and language.

How can we be sure that the written word brings him the exact idea the author had in mind, the author who has been there, who has seen for himself? Children seldom have had the experiences an author writes about. Often the author's words may set the child to thinking about an altogether different experience from what the author meant to report. Frequently a given word becomes associated with what the adult calls a "wrong" experience. Out of these circumstances we see the poor reader emerge, the child who is content to sit in the corner and remain silent.

The first-grade child who said that her younger sister was "double years old" related her own "twice as much" understanding of the word "double" to the fact that her one-year-old sister had passed her second birthday.

The urban youngster who reported that she reached adolescence before discovering through first-hand experience that a cow was bigger than a mouse had read the story of dairying in complete absence of anything but literal interpretation of the cow-and-stanchion photograph in her second-grade reader.

The third-grader who was bewildered by the story of the boy on the bicycle who always rode "ahead" was applying literally his understanding of the word "head." Little wonder that he saw difficulty in riding a bicycle and a "head" at the same time.

Often in the transition from the storybook, fairy-tale literature of the pre-primary and primary level, children find it difficult to accept the reality of things they read about in upper-grade books. Reading material about people and events in remote places is often only partially understood because the child has had little or no concrete experience from which to gain an understanding of the words he meets.

A boy in the fifth grade, after reading a chapter on the pygmies in Africa, in all seriousness questioned the existence of such places, things, and, most important, people. His earnest question, "Are they like fairies?" revealed his skepticism.

To vocalize the sounds of the printed word symbol without associating a meaning with that symbol is pure verbalism. To pursue reading per se in the absence of wide readiness experience in the first grade, junior high, or high school is the academic crime of verbalism—verbalism which refers to reading as a mechanical thing without understanding. *Children and young people who read must first have wide opportunities for the direct experiencing or contrived experiencing of the things, events, processes, or ideas to which the printed symbols refer. It is only on the basis of experiencing that the printed symbol can take on comprehension or understanding.*

The meaning of the printed word is almost always associated with previously gained understandings, most of them concrete. *Just as the primary teacher acknowledges that before the word must come the idea, so in all aspects of learning, upper grades and high school, each teacher must assume the responsibility for being sure that the background experiences which underlie the comprehension of the printed word are provided for the conscious experiencing and understanding of the student.* This is as true of a second-grade social studies pupil as it is of the college freshman enrolled in biology, mathematics, or the social history of the United States.

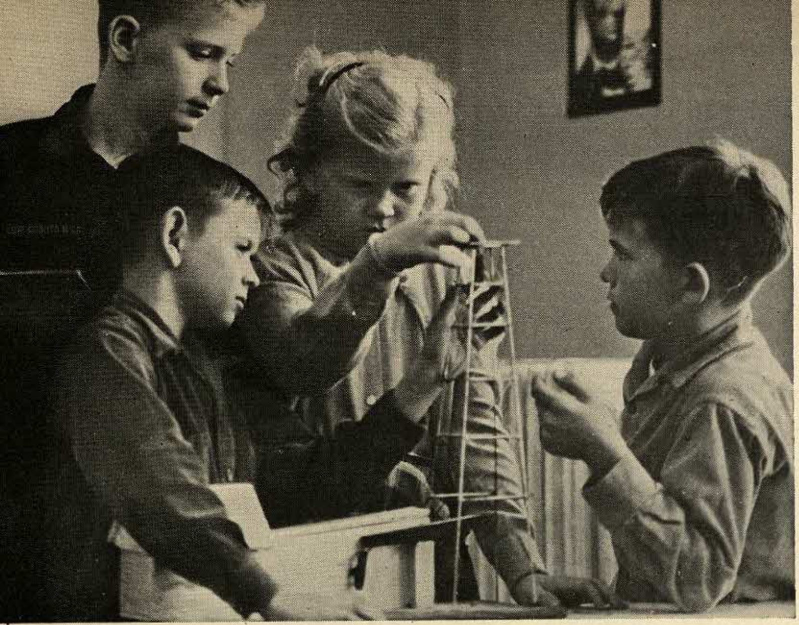


Fig. 2.11. A background of experiencing yields valid understanding. Out of such backgrounds springs the substance for creativity of expression. How does this experiencing anticipate creativity? How might it show itself?

EXPERIENCE AND CREATIVE EXPRESSION

Children of relatively equal intelligence will vary in their enthusiasm for entering into a conversation, making a report, or participating in recitations very largely in terms of the ideas they have. The child who comes from a home where the family conversation includes him, where good books are available, where vacation trips are often taken, will have a decided advantage over the child that does not have these opportunities.

An art teacher in a large midwestern city was asked what relationship she thought existed between experiential background and artistic expression. Her reply indicated that, on the basis of her observations of children's ability and art, she was convinced that there was no such thing as creativeness per se, but rather that the child who had wide experience with things had lots of ideas to put down on paper. Similar observations have been made concerning written composition. The child who has had much experience with things and events usually is not at a loss for a subject to write about; the reverse is true of the child who has not had the advantage of wide experiencing.

OVERCOMING SOME BARRIERS IN TEACHING

Teachers in the modern school create innumerable situations for realistically bringing an understanding of the world to children. But ask any teacher the question, "Are you satisfied with what you are doing?" and he will say, "Yes—reasonably so—there are many things that I know I should be doing, but I cannot for one reason or another."

If this point is pressed, the conversation may proceed like this: "I can't do much about taking my children to 'faraway places.' Reading is too often the only medium through which I can give the children experience with the cultures, peoples, vocations, and home life of other lands. I realize that no child can attach real meaning to this verbal experience—he hasn't really seen, really known these people; the words are, well, just so many words. The child who has never seen the home of an Indian farmer in the Punjab, the child who has never been in the home of a Greek farm family on the barren slopes near Athens, the children who have never lived on the south slopes of the Atlas Mountains—well, how can they know? Often I wish I could do something about this, but I realize that it is relatively impossible, so I just do the best I can."

A little way down the corridor another interview reveals a similar feeling of inadequacy: "It's like this. In the spring we begin talking about the growth of plants or the life cycle of insects. We want to learn just how all this happens, but we can't watch things grow. It happens too slowly. Suppose we planted a seed in the window box over there. In order to watch that seed actually grow we might have to say, 'Johnny, you take the 12 to 1 o'clock shift; Mary, you take the 1 to 2 shift; Betty, you take the 2 to 3 shift,' etc., around the twenty-four hours. That would be impractical if not impossible. If we want to watch the butterfly as it emerges from its cocoon, we'd have to post a twenty-four-hour watch in our classroom so that someone would always be there to sound the alarm when at last that marvelous event, the 'breaking out,' occurs. Oh, there are many things in science that we can talk about. If there were only some way to see them all happen. I guess that is one of those impossible things. We'll just have to do the best we can."

And an interview with the history teacher in the high school goes something like this: "Every time we work at the unit on westward expansion we talk about covered wagons, sod houses, and Sutter's Mill. We speak of such terms as 'privation,' 'frontier spirit,' 'hardship,' 'individualism.' I see the puzzled frowns on my students' faces, and I say to myself, 'If I could only turn back the clock. If I could only take these students *to see the things we are talking about.*' But we can't, so we make the best of the job by turning to the pages of our textbook and looking at the crude woodcuts and the line drawings which adorn them. If only we could have real, living, background experiences of our own. If only we could know the actual experiences these pioneers had. What a way *that* would be to study history!"

The home economics teacher reports: "Too often I feel that we are just mixing ingredients. We put in so much of this and so much of that, set the oven at the proper temperature, and presto, out comes the finished product. For most of the youngsters, that is all right. It's just do this, do that, and you get the results. But more and more youngsters are becoming curious. They want to know *how* this happens. I do the best I can by explaining about the leavening processes, about the action of shortenings on the tiny granules of starch, but something seems to be lacking. I can't always be sure that the thing I see in my own mind is being understood by the children. I guess there isn't too much I can do."

All these traditional barriers to complete experiential learning have long been recognized. There are beginnings that any teacher can make regardless of the classroom situation in which he finds himself. He can examine the use he makes of the blackboard. He can investigate the community for field trip possibilities. He can start making his own file of mounted pictures, and pay more attention to the bulletin boards he arranges.

But today, among the many things that are credited to the genius of twentieth-century man, a new technique for improving instruction—audio-visual education—has emerged and continues to develop. It is the means by which the experiences of the world, regardless of whether they existed in the past, are apt to exist in the future, or exist now in some remote portion of the planet, can be brought into any classroom in any community. Through the medium of the filmstrip, the motion picture, the transcription, the radio, television, and the slide—through the teacher's opportunity to handle creative activities in any of these media, we can investigate the outlying reaches of our physical world. The physical environment, whether it be "too big," "too small," "too fast," or "too slow," can be captured for study and restudy. Knowledge about the world can be made available to the smallest class in the most remote school in the country at the exact moment of need—all at the click of a switch.

The youth who come to our schools today are living in a world in which all the people face the problem of survival. They must know not only what Pumpkin Hollow raises as its chief products but that new jet terminals have been built in central China. They must know why automatic voting machines are being increasingly adopted and why children in some lands are starving or in need of educational opportunities similar to those that are guaranteed to all the children in the United States. They must know that in India the untouchable caste has been legislated out of existence and that at least a minimal public education is now provided for all the children. Most important, they must understand the implications of all these circumstances and events for the world they will enter as adults. Upon their shoulders the responsibilities of tomorrow will fall.

The modern school plant has become the place in which pupils learn, experience, prepare for, and understand their place in tomorrow's world. The school must reveal the living world of today if it is to help build the kind of civilization we wish to guarantee for tomorrow.

SUMMARY

Our understanding of events, places, and objects is a direct outgrowth of our ability to perceive. Our perception of things depends on our ability to see, hear, touch, taste, and smell. As individuals we gain an understanding of our surroundings through the interplay or interrelationship of our own sensory perceptor organisms.

The basis of all understanding, thinking, and attitude formation is real experience. In a world which is daily becoming more complex because of the growing interrelationships of man, the child in school needs to know more about his entire environment. Because in this complex world the learner is unable to have a wide range of firsthand or real experiencing, the problem of the teacher becomes more complicated.

The responsibility for providing firsthand experiences which may lead to understanding affects many areas of the curriculum.

Other things being equal, the child who is a good reader will succeed in terms of his readiness or background experiences. On the basis of many and wide experiences he will be able to associate meanings with the words which symbolize or "stand for" these experiences.

The child who is asked to express himself through the medium of art, drawing, oral or written communication, etc., needs to have many firsthand background experiences. The child who has many of these experiences is more likely to succeed in creative expression because he has many understandings based on perception from which to draw his creative ideas.

In our schools we are investigating a complex physical and social environment often characterized by phenomena which are too big, too small, too fast, or too slow to be captured for classroom study. Frequently distances interfere with firsthand experiencing. In this kind of complex world the role of contrived experiences becomes very important to classroom procedure.

Suggested Activities

1. Select a description of some little-known object from an encyclopedia. Read it to your classmates. Ask them to "rough sketch" their visualization of this description. Examine the sketches for evidences of differing background experiences.
2. Arrange a role-playing situation similar to that described on page 26. Ask the

members of the group to indicate the size of a seahorse or some other object, as they remember it. Use an excerpt from a film comparable to that from *Eli Whitney*.

3. Examine the learning objectives listed in a typical unit of work in a course of study in a subject area in which you are interested. As an alternative, analyze some of the study questions at the end of a typical chapter from a textbook in a subject you are interested in. State the background perceptual experiences a learner must have in order to respond intelligently to the activity in question.
4. Arrange to view a 16mm. sound motion-picture teaching film. Select a film you are interested in, such as one of the following:

    Benjamin Franklin, B&W, 18 min., Encyclopædia Britannica Films.
    Eli Whitney, B&W, 18 min., Encyclopædia Britannica Films.
    West Germany—The Southern Uplands, Color, 18 min., United World.
    The Republic of the Philippines, Color, 18 min., United World.
    Desert Nomads, B&W, 22 min., United World Films.
    Farmers of India, B&W, 22 min., United World Films.

    a. Before seeing the film, list not more than a half dozen impressions or understandings you have about the subject.
    b. After you have seen the film, make a list of specific new understandings or changes in attitude that you experienced as a result of viewing it.
    c. What generalization can you make about the teacher's responsibility to provide audiovisual readiness experiences not only in film form but through other audiovisual devices?
5. Interview a primary-grade reading teacher, and ask the following questions:
    a. What readiness activities do you help children engage in before attempting beginning reading?
    b. What is the relationship of readiness activity to success in reading?
    c. Are home backgrounds (presence of good books in the home, family travel, family group conversation) reflected in children's reading success?

    Report your interview to your classmates. What conclusions do you have?

    Conduct similar interviews with teachers of art, social studies, etc. Formulate similar but appropriate questions for your interviews.

Bibliography

Allport, Gordon W., "Attitudes," *A Handbook of Social Psychology*, Clark Univ. Press, 1935.

Encyclopædia Britannica, Aard-vark, Senior Volume I, p. 4.

Kingsley, Howard L., *The Nature and Conditions of Learning*, Prentice-Hall, 1947.

Klausmeier, Herbert J., *Learning and Human Abilities: Educational Psychology*, Harper, 1961.

Klausmeier, Herbert J., and Dresden, Katharine, *Teaching in the Elementary School*, Harper, 2nd ed., in press.

CHAPTER 3

THE CHALKBOARD

When the science class was dismissed, the supervisor paused to comment to the teacher.

"A most interesting lesson," he said, "and all the more impressive because of the way you visualized many of these new science concepts; for example, the way you explained how international television is made possible through the use of space-orbiting reflector satellite-balloons."

The teacher nodded. Contemplating the current science news materials on his desk, he said:

"Many of these concepts are so new that about the only source

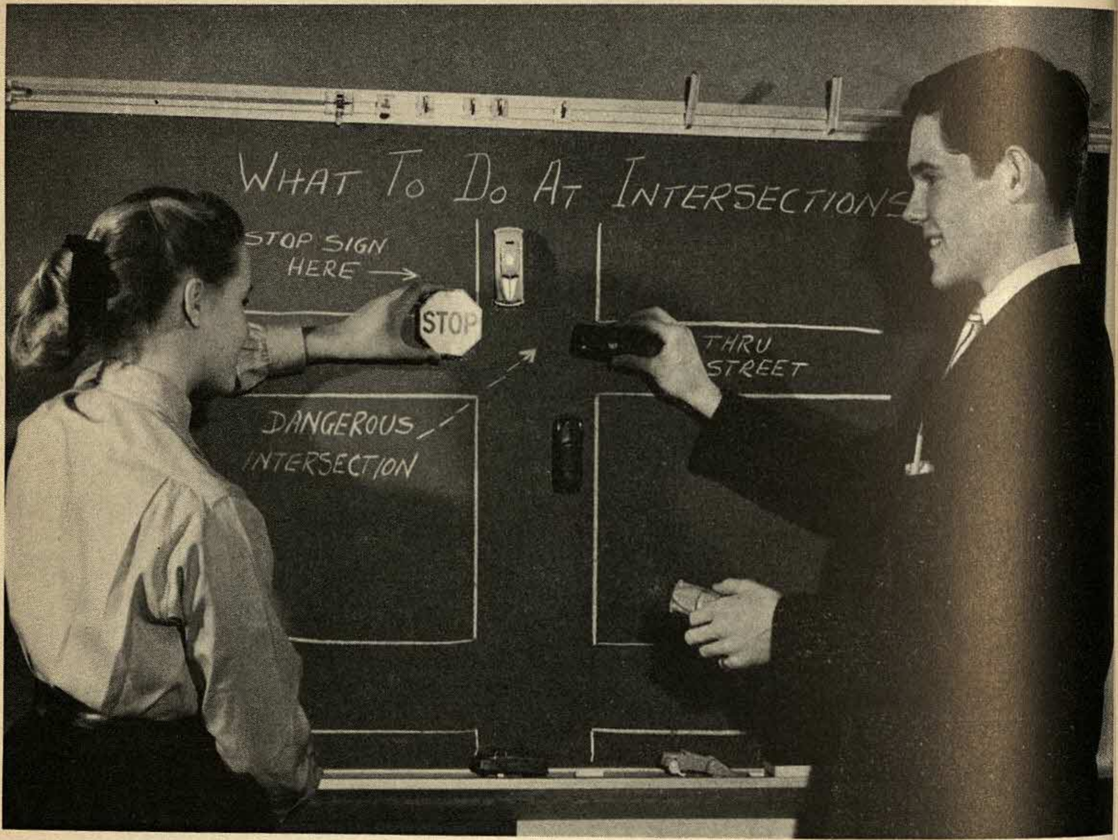


Fig. 3.1. A weldwood chalkboard. What factors should determine the type, size, and placement of the chalkboard?

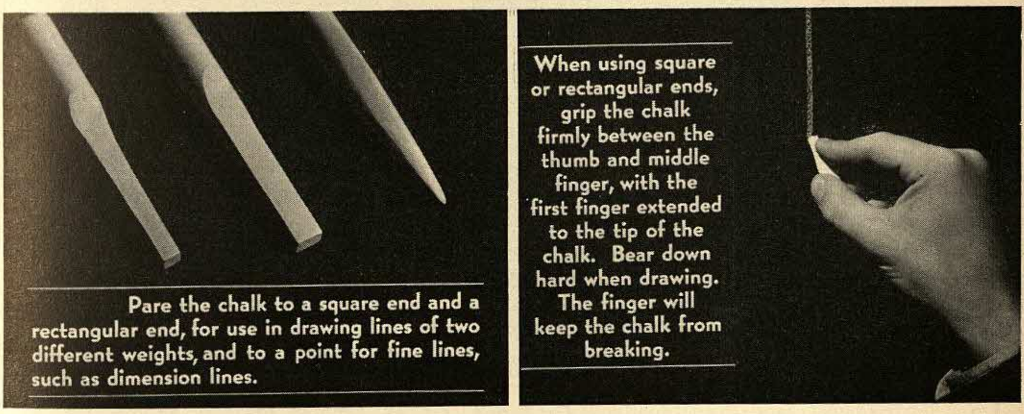
of information is periodicals, news announcements, and radio and television reports such as we discussed in class today. In presenting these concepts I invariably use the chalkboard to visualize those that are too new to appear in books."

The chalkboard—or blackboard as it was long called—is so much a part of classrooms that it has become synonymous with education itself. A chalkboard is almost always at hand during a class; yet how many of us are guilty of overlooking its possibilities as a sure, quick, and easily accessible means of visualizing important ideas—particularly those which arise during discussion and virtually demand visualization for complete understanding?

Even in this modern space age the chalkboard continues to be a basic means of presentation. Teachers will use it even more effectively as they understand more completely its characteristics, flexibility, and the opportunities it presents for efficient instruction. It is the purpose of this chapter to describe the chalkboard and the many teaching techniques which make it a valued means for instruction.

THE MODERN CHALKBOARD

The chalkboard today has many forms. It varies from the smooth flat surface of quarried slate, still used in many older schools, to the pastel-colored, dull-surface chalkboard areas which fit beautifully into the general decorative scheme of the modern classroom. Between these extremes there are dull-finish plastic, mossy-surfaced glass, paint-coated plywood or presswood, and vitreous-coated steel chalkboards. These last provide magnetic adhering properties in addition to the traditional properties of chalkboards in general.



Pare the chalk to a square end and a rectangular end, for use in drawing lines of two different weights, and to a point for fine lines, such as dimension lines.

When using square or rectangular ends, grip the chalk firmly between the thumb and middle finger, with the first finger extended to the tip of the chalk. Bear down hard when drawing. The finger will keep the chalk from breaking.

Fig. 3.2.

In the usual classroom, a minimum of 16 to 20 linear feet of chalkboard space is needed (Fig. 3.1). In classroom situations that call for specialized uses of the chalkboard, suitable adjustments in terms of size and position in relationship to viewers may call for special installations. However, in order to take full advantage of the chalkboard as an integral part of classroom teaching, you should know the following characteristics of an effective chalkboard:

1. It provides maximum contrast between background and line drawings or printed symbols. In short, the surface "holds" a good chalk image.
2. It eliminates glare. Glare is a common problem with the traditional smooth-ground surface or with surfaces that are poorly cared for.
3. It can be easily erased or cleaned without leaving "ghosts" or smudges. This is true of both white and colored chalk.
4. It is colored to blend with the interior of the room, but at the same time

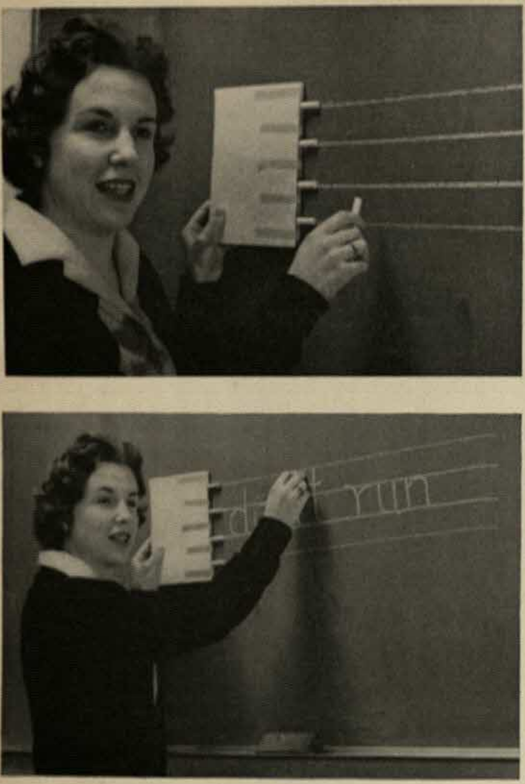


Fig. 3.3. This liner is made from taped-together folded cardboard, yet it serves well to inscribe guide lines quickly.

it must be efficient in terms of visual presentation. Effective chalkboards are available in pastel green or yellow, or in black.

5. It is mounted so as to be within easy arm's reach of the pupils. Its positioning should vary, depending on the age of the students using it.

Ordinarily your classroom will provide good chalkboard surface areas. But if, on the basis of the information in this chapter, you feel that you could improve the quality of classroom work if better chalkboard surfaces or facilities were provided, you should consult your supervisors or school administrator.

IMPROVING CHALKBOARD USE

A basic understanding of caring for the chalkboard, of selecting and preparing the chalk, of lettering, of making simple line drawings, and of creating more complex visualizations by means of special chalkboard techniques should give any teacher reasonable facility in creating exciting chalkboard study opportunities.

CARE OF THE SURFACE

Although in most classrooms the building custodian takes care of the chalkboards, every teacher should understand how the chalkboard can be kept at the highest level of efficiency. A high-visibility chalkboard has a slightly abrasive surface that is made up of minute teeth and cavities. It is this abrasive surface which holds the particles of chalk that make the contrasting lines easily visualized.

Before using a chalkboard, remove all excess chalk powder and surface dust with an eraser, either felt, sponge rubber, or chamois. A uniform downward stroke of the eraser is best, for this knocks the chalk dust into the chalk rail; the rail should of course be cleaned regularly. If the eraser is felt, wipe the chalkboard with a soft cloth or dry chamois skin to remove any chalk that may remain. Even a properly cleaned chalkboard has a chalked-on appearance, but this is not troublesome.

Avoid using oily rags or oil on any chalkboard surface. Chalk consists of a binder and English whiting; hence chalk dust and oil produce a gluey emulsion which gradually fills up the cavities in the surface so that it can no longer carry a well-defined chalk mark.

Some chalkboards may need special care. Instructions accompanying several types of composition boards which are factory-surfaced with green pigment warn against using water or liquid cleaners. However, cleansing agents can be used periodically on the newest types. Some boards can be cleaned with mild abrasives without danger of wearing away the abrasive surface.

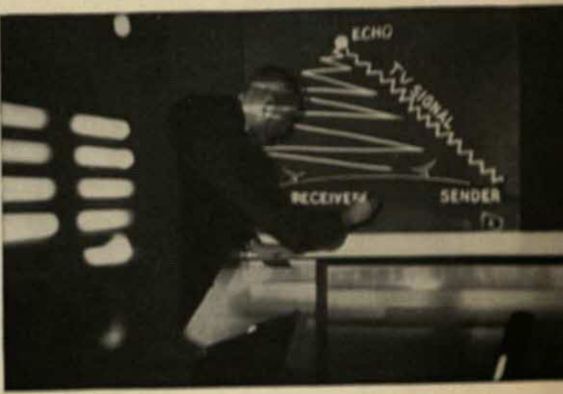


Fig. 3.4. A special diagram is projected by means of an opaque projector and the key lines are roughed in. Under what conditions is this use of a projector more valuable than projecting materials for viewing on a screen?

CHALK

As was said above, chalk is manufactured from a mixture of English whiting and a binder. High-quality chalk usually contains a higher percentage of this whiting. It is poor economy to buy chalk which may cost a few cents less per box but which contains lesser amounts of whiting. The ingredients in some cheaper grades of chalk are in themselves abrasives which slowly wear away the surface of the chalkboard.

The use of colored chalk should be encouraged for at least two reasons. Color is both pleasing and intrinsically interesting to students. More important, there are many cases in which meaning and understanding can be increased by means of color. Colored chalk is specially made for chalkboard use. It should not be confused with the colored chalk used on plastic-coated surfaces. A good quality of chalkboard chalk produces a vivid visual image and is easily erased; it does not leave unsightly smudges.

Just as pencils are sharpened to broad, sharp, blunt, or rounded ends, so should full-length pieces of chalk be prepared for specific tasks (Fig. 3.2). For harsh outline work the chalk should first be scraped over coarse sandpaper to produce a blunt-angle end surface. For detailed shading or faint guide lines the chalk should be sharpened to half its original diameter. For shading, grasp the chalk so as to bring the longest surface against the chalkboard. Use high-quality chalk which is neither crumbly nor extremely hard. Discard the last bit of chalk.

When a portion of the chalkboard visualization is to be used repeatedly, a semipermanent chalk may be prepared as follows:

1. Prepare a saturated sugar solution by stirring sufficient sugar into a cupful of cold water so that, after vigorous shaking or stirring, a small amount still remains on the bottom of the container.
2. Prepare a second solution consisting of one part of this sugar solution to three parts of cold water. Soak a few sticks of chalk in this solution. When the chalk no longer gives off bubbles (five to ten minutes), remove it and drain for a short time on paper toweling.
3. The treated chalk can be kept indefinitely by storing it in an airtight container, such as a peanut butter jar.
4. Use the chalk like regular chalk, but it may crumble slightly more easily; hence care is needed in using it. Lines made with this chalk can be removed from the chalkboard with a damp cloth. (See Source Lists, page 477, for chalkboard ink.)

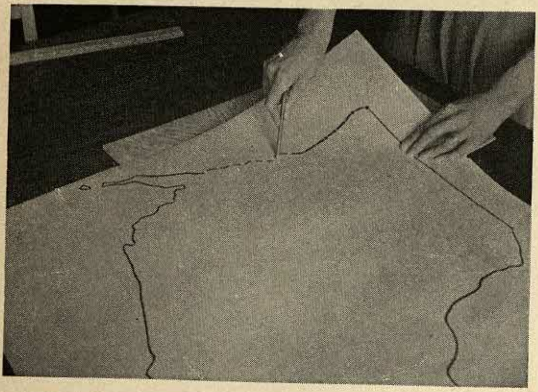


Fig. 3.5. Punch the holes about an inch apart.

Handling the Chalk. In the primary and intermediate grades, regular amounts of time are spent on penmanship and the correct manner of handling pencils, pen, and ink. Similarly, some time should be spent in learning to handle chalk, for there is a correct way of using it. A few practice strokes will help you to use it effectively.

Experiment with the chalk, drawing straight lines and circles. For good visibility, be sure to draw lines as wide as the chalk permits.

Just as the art teacher assembles brushes, paints, and easel and learns their use, so you will become more effective in using the chalkboard by providing yourself with chalkboard rulers, compasses, templates, stencils, and similar tools, and learning how to use them.

LETTERING

The primary purpose of the chalkboard is to communicate ideas; hence good lettering techniques are essential. These may include cursive writing, printing, and carefully blocked-out words and phrases.

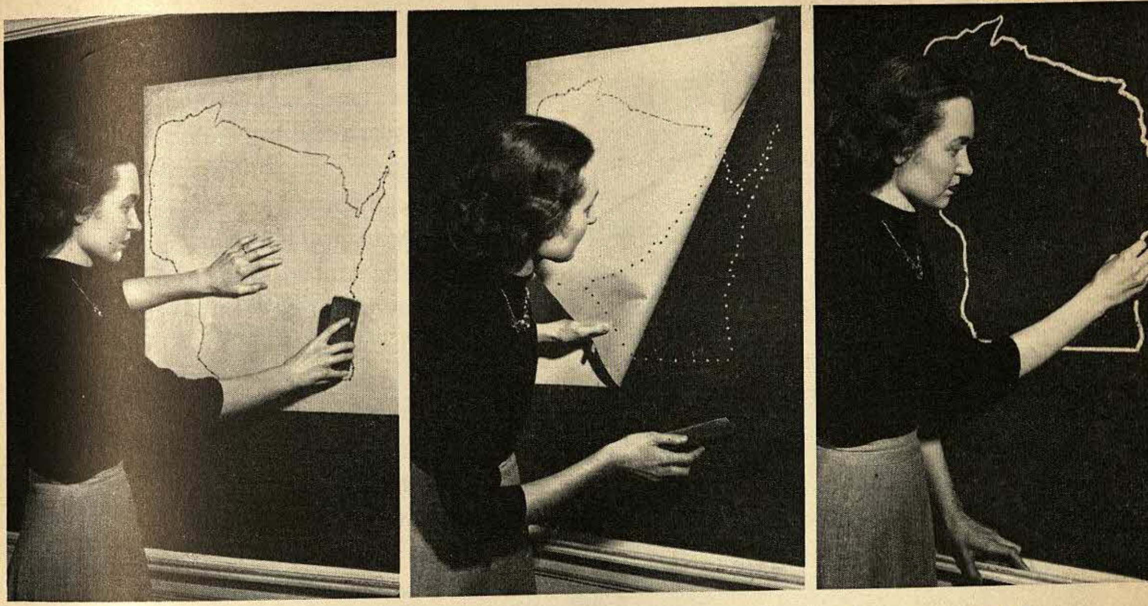


Fig. 3.6. *Left:* Hold the pattern firm. *Center:* Check the line before removing the pattern. *Right:* Connect the dotted outline.

Like the expert draftsman, the teacher should not proceed until he has laid out a general plan of work. The use of guide lines gives cursive writing and lettering uniform size and insures that they will be easily read. To make sure that the lettering is visible to children even at the rear of the classroom, the letters should be at least 2½ inches in height, preferably 3 inches.

Printing usually is more legible than cursive writing. Although one would suppose that cursive writing is much more rapid than printing, reasonable practice with simple block letters gives speed in printing. Although the letters may appear unusually large to the person who is writing them, a walk to the rear of the seating area will reveal that they are of comfortable size for reading and understanding.

Depending on the teacher's ability, there are several quick ways of providing guide lines and spaces needed for lettering.

1. Guide lines may be made with a T-square. Rest the base of the T-square against either the left or the right edge of the board and move the instrument up and down, drawing lines where needed.
2. A simple music-staff liner may be used for horizontal lines. Removing the center chalk from the liner provides space for the main body of the letters.
3. A cardboard liner like that in Fig. 3.3 can be made quickly and easily

by making a single crease in a stiff piece of cardboard and holding the two edges together by staples or masking tape applied at regularly spaced intervals. The cardboard between the staples or tape is squeezed open, and pieces of chalk are inserted for drawing parallel lines for lettering.

THE PROJECT-ON, CHALK-ON METHOD

The project-on method is ideal for presenting needed visualizations in science, social studies, and language arts to the class.

Newspaper and magazine pictures and diagrams can be quickly recreated on the chalkboard by cutting them out, placing them on the platform of an opaque projector (see Chapter 12), and moving the projector as necessary to focus an image of the desired size on the chalkboard. The teacher can then chalk on or trace over the key lines in the projected image (Fig. 3.4), thus quickly transferring to the chalkboard the basic idea of the projected material. He may experiment in a darkened classroom to discover how best to place the projector and sharpen the focus.

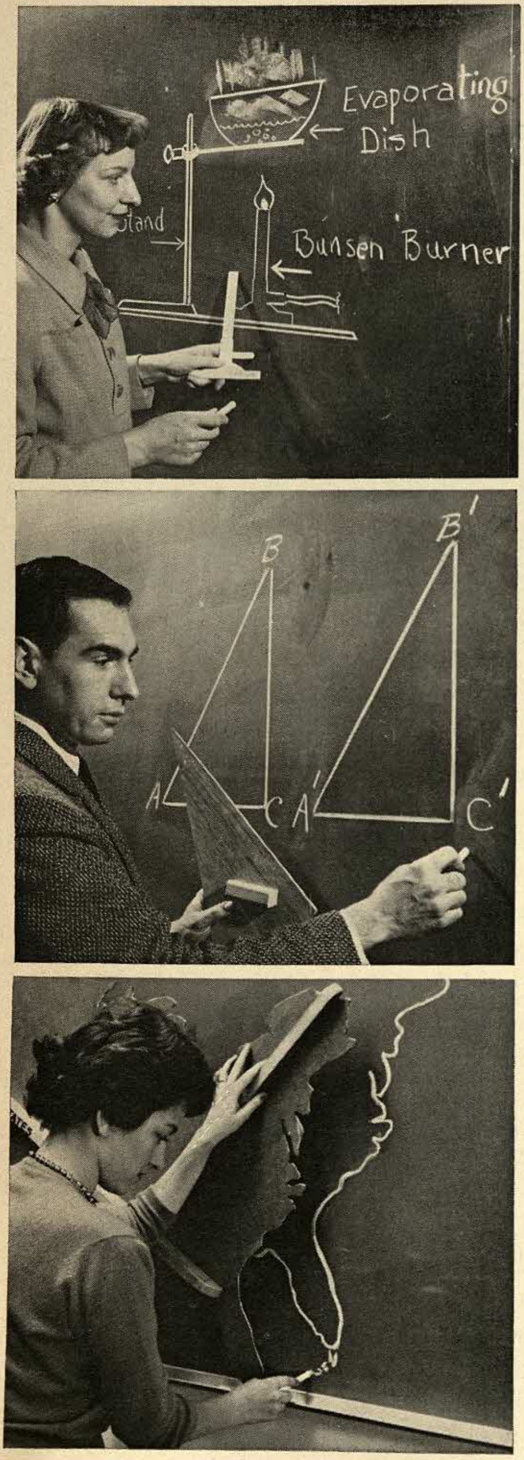


Fig. 3.7. The science teacher may use templates of beakers, retorts, burners, etc., to visualize experiment setups for the class. In mathematics, templates guarantee accuracy even in quickly sketched figures for theorems. The social studies teacher may use templates when accuracy of intricate chalkboard visualizations is needed. In addition to those shown, what ideas for the use of templates do you have?

A variation of this method is achieved by using a 2″ x 2″ slide or filmstrip projector. Frequently, a teacher finds that certain visualizations are more satisfactory as a chalkboard device than as a projected image on a screen. For example, in treating developmental concepts, he may transfer the basic simplified diagram to the chalkboard and later during the class add to it symbols, lines, or visual devices to demonstrate the sequential development of a process, language arts skill, or science understanding. The projector should be set up so that the desired size of image is projected on the chalkboard to allow the key lines to be chalked on.

The project-on method assures the teacher that the projected material will be readable, understandable, and valuable in instruction.

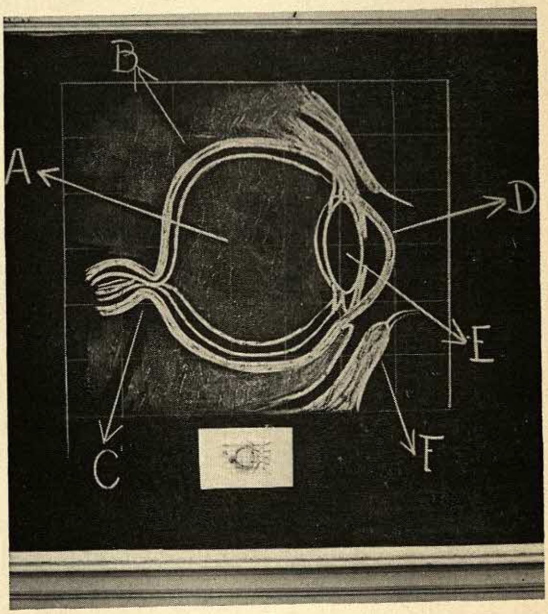


Fig. 3.8. The grid method can be used to enlarge a small diagram easily.

THE PATTERN METHOD

The pattern technique is well suited for basic visualizations which are needed frequently. The mathematics teacher who is confronted again and again with the problem of explaining line graphs; the music teacher who wants to illustrate note reading techniques; the geometry teacher who needs to use repeatedly various types of triangles, rectangles, and parallelograms; and the social studies teacher who refers constantly to outline maps of county, state, or continent find the pattern technique of great assistance. The pattern method is sometimes called the punch or pounce system.

Suppose that an intermediate-grade teacher frequently refers to an outline map of her state. Therefore she wants to devise some means of quickly putting this map on the chalkboard. She is not content with guesswork or with the wobbly map produced by freehand sketching. As the first step she carefully draws the outline of the state on a piece of heavy tracing paper. Then, with a leather-worker's punch 1/8 or 3/16 inch in diameter she perforates the outline at approximately 1-inch intervals, or closer if the detail of the contours is more complex (Fig. 3.5). Experimentation will indicate how close the holes should be. The distance may vary from a quarter inch to one inch, depending on the nature of the drawing.

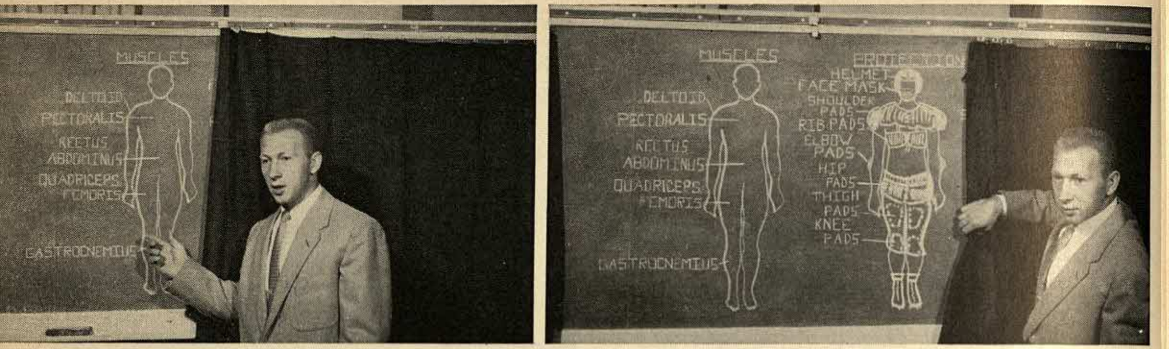


Fig. 3.9. The use of the "hidden" chalkboard allows the teacher to reveal only those portions of the previously prepared complete sequence of illustrations which are most useful to the discussion at the moment.

When the complete drawing has been "punched out," the teacher holds the pattern against the chalkboard and rubs a dusty eraser firmly across the perforated section of the outline. (Note: The eraser should be rubbed back and forth across the perforations, not patted.) Thus an outline of chalk dots appears where the perforations in the pattern were. She then connects the dots, freehand, with chalk. The entire procedure is shown in Fig. 3.6.

Patterns that are used repeatedly may be mounted on window-shade rollers and filed in an orderly way. They are thus available for use at a moment's notice and they can be suspended easily from hooks along the top of the chalkboard rail. (Commercial patterns are now available[1] for such subject areas as mathematics and geography.)

THE TEMPLATE METHOD

The template is another device for drawing on the chalkboard diagrams, symbols, and designs which must be accurate and exact, or which need to be drawn repeatedly.

Chalkboard templates may be made of any thin, stiff, light-weight material—sheet metal, heavy cardboard, plywood, or masonite. The design should be drawn on the material and then cut out (if possible, cut out a handle, too); the template is then ready for use. The template is held against the board with one hand and is outlined on the board with chalk. Pupils, teachers, and custodians may make templates as the need for them arises. When not in use, they can be hung from hooks attached to the under side of the chalk rails. Templates in use are shown in Fig. 3.7.

THE GRID METHOD

The grid technique for chalkboard illustrations is within the grasp of every teacher. The illustration or original drawing may be on any ordinary

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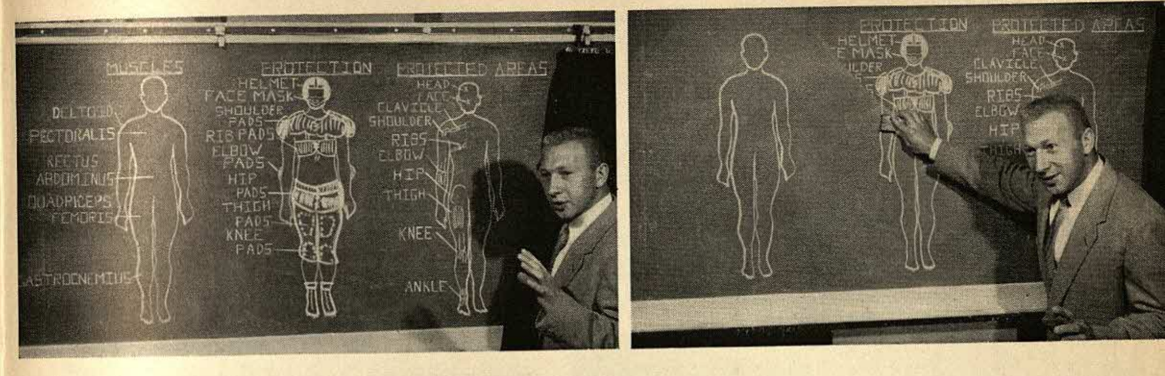
[1] Corbett Blackboard Stencils, 548 Third Ave., North Pelham, N.Y.



size of paper, from 3 by 5 inches to 8½ by 11 inches. It is blocked off into squares, which may be half or three-quarters of an inch, 1 inch, or even larger. Smaller squares are necessary if the original has much detail. The less complex the drawing, the larger the squares may be. The chalkboard is marked off in larger squares. In transferring the drawing to the chalkboard, the teacher duplicates the original, one square at a time, on the chalkboard (Fig. 3.8). The grid technique is amazingly rapid. A few practice sessions will give the teacher surprising facility in its use.[2]

THE HIDDEN DRAWING METHOD

The hidden drawing technique is a unique way of coordinating demonstration and explanation, by either pupil or teacher, in practically any subject area. By preparing in advance a series of sequential or developmental illustrations, the teacher can describe and expose one illustration at a time. In this way, attention is focused on the explanation that accompanies the exposed drawing and the sequence can be maintained, since of

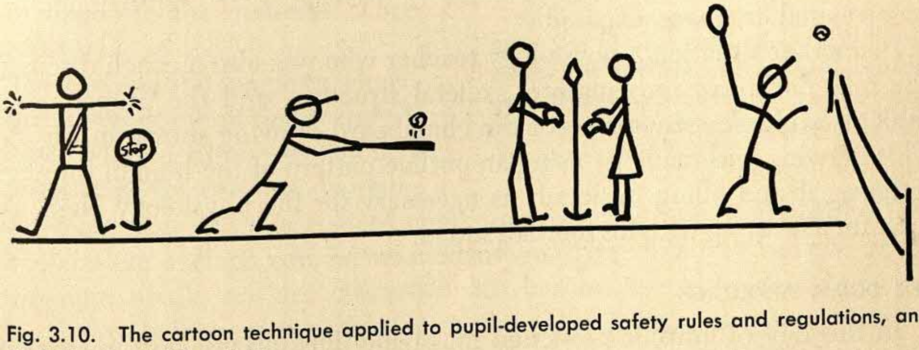


Fig. 3.10. The cartoon technique applied to pupil-developed safety rules and regulations, and junior-high-school club activities.

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[2] *Chalkboard Utilization,* Sound, B&W, 15 min., Young America Films.

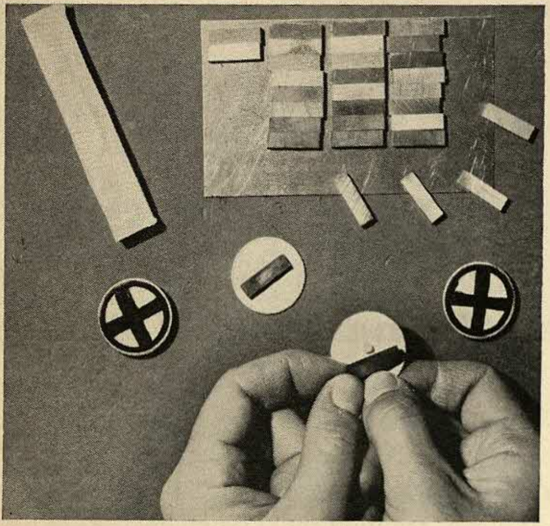


Fig. 3.11. Any three-dimensional light objects can be mounted with adhesive on small magnets for use on steel chalkboards.

necessity all eyes are on the chalkboard. Stretching a wire along the top of the chalkboard and hanging inexpensive cloth from this wire make the hidden drawing technique a reality in any classroom.

This technique was used by a biology teacher who wished to explain the food-getting habits of the amoeba. Before the class convened, four carefully worked-out drawings were put on the chalkboard. When the class entered the room the chalkboard surface was completely hidden by the wire-strung green cotton curtain.

When the teacher announced the subject of the lesson, "Food-Getting Habits of the Amoeba," he drew the curtain aside enough to reveal the outline diagram showing the structure of an amoeba. The contours of the cell wall and the location and meaning of the symbols representing the nucleus and the food vacuole were discussed.

The first stage of the food-getting activity was next described as the instructor moved the curtain farther to the right and revealed the second drawing.

As the discussion continued, additional stages in the amoeba's adaptation for food getting were disclosed by moving the curtain progressively to the right. At the end of the explanation the diagrams were "hidden" and the prearranged test was exposed.

In another situation a physiology teacher who was also a coach discussed the relationship of musculature, skeletal structure, and the proper use of athletic equipment by means of the chalkboard drawing shown in Fig. 3.9. This drawing was made by using an outline pattern of the human form and lettering it and filling in details as necessary for the physiology class, and later for a meeting with his football squad.

THE COMIC APPROACH

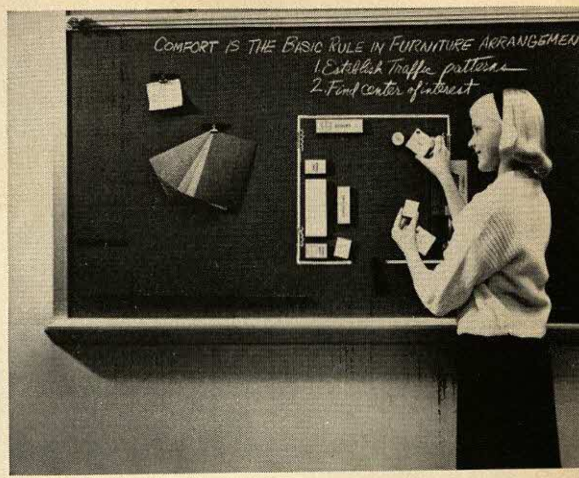
In this day of graphic news and magazine illustrations, both pupils and teachers are well acquainted with cartoon techniques. Examination of popular cartoons will reveal that not all cartoonists are artists. Many cartoons are rudimentary visualizations in which simple lines are used to outline objects. The use of this technique is shown in Fig. 3.10.

You can draw this well or better. Try it. Apply the cartoon approach to some situation you wish to describe to the class—announce an event, or remind them about the care of the desks, schoolroom, or their personal belongings. Soon you will develop a visual cartoon "vocabulary" of simple line drawings which anyone can use to add interest, fun, and clear-cut visualization to chalkboard learning situations.

THE MAGNETIC CHALKBOARD

The magnetic chalkboard is a recent development in classroom equipment which has all the advantages and uses of more traditional types of chalkboard and, in addition, permits the use of two- and three-dimensional materials which adhere to and can readily be moved on the surface of the chalkboard by means of miniature magnets affixed to the materials. (See Fig. 3.11.)

The surface of a magnetic chalkboard is composed of fine-textured, almost indestructible, permanently colored particles of vitreous material which takes white or colored chalk impressions evenly and visibly. The porcelain-like surface can be washed or gently scoured to remove semipermanent chalk, or "dry cleaned" with carbon tetrachloride to remove permanent chalkboard ink, colored chalk "ghosts," and adhesive materials. The under surface of the board is steel, which makes it possible to use magnets attached to two- or three-dimensional materials.


COMFORT IS THE BASIC RULE IN FURNITURE ARRANGEMEN
1. Establish Traffic pattern
2. Find center of interest

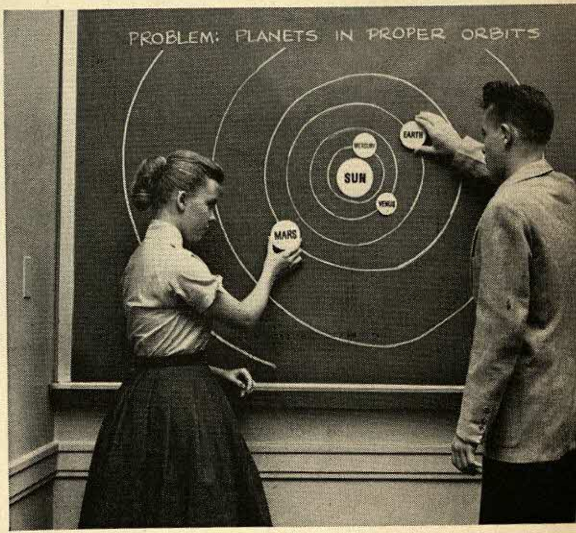

PROBLEM: PLANETS IN PROPER ORBITS
EARTH
MERCURY
SUN
VENUS
MARS

Fig. 3.12. The magnetic chalkboard opens up a host of new ideas. The interaction of words and symbols and movable two- or three-dimensional objects can result in high learning outcomes. How can you apply these ideas in your work?

The steel chalkboard, adhesives, magnets, etc., are tools with which imaginative teachers and pupils can create fascinating and highly useful aids to the realization of learning goals (Fig. 3.12). The English teacher can quickly alter the position of word roots, prefixes, suffixes, and stems to indicate the derivation of words. The chemistry teacher can rearrange the symbols of molecular structure, the parts of a chemical equation, or the numerical values ascribed to parts of a formula within a matter of seconds. The home economics teacher can visualize the relationships of floor plans to living efficiency.

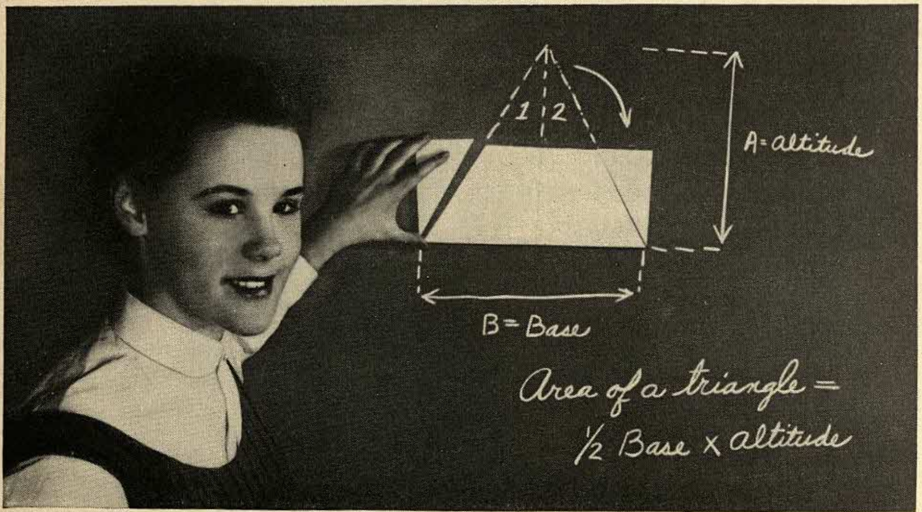


Fig. 3.13. Mathematical equations can be developed and explained by "animating" the chalkboard as shown here.

THE ROLE OF THE CHALKBOARD IN INSTRUCTION

Chalkboards have long been used in the primary grades for experience stories which the children dictate and the teacher prints; this use continues, for it is still valuable. In the intermediate grades the teacher who introduces a new unit of study by writing interesting questions on the chalkboard usually captures the imagination of his pupils and channels their interest toward the new unit. As the lessons continue, the chalkboard is useful for listing the references to be consulted and the questions that the class has answered, and for summarizing the work that has been completed.

A combination of chalkboard techniques, including the use of color, is valuable in teaching arithmetic and mathematics at various levels, as for example in explaining division of whole numbers in the primary grades, and

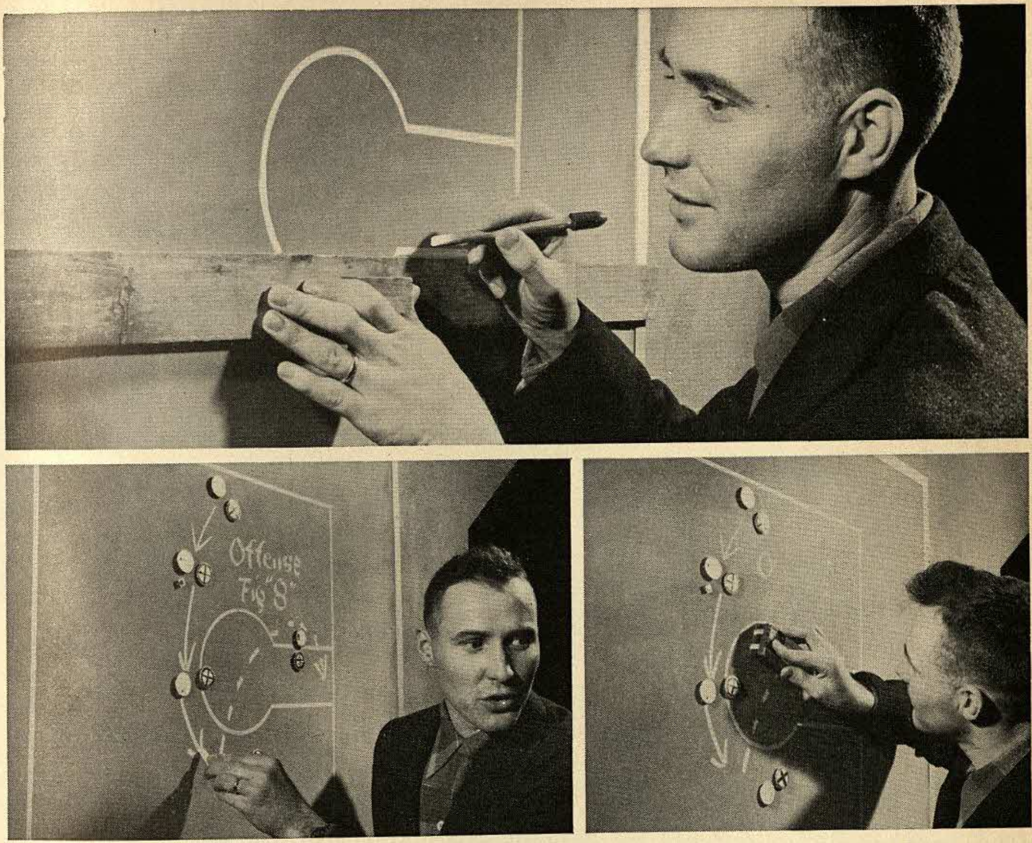


Fig. 3.14. The steel-porcelain magnetic chalkboard. The "permanent" basketball court is drawn with chalkboard pen and ink, magnet-held player symbols can be slid quickly from place to place, and unwanted chalk marks can be erased easily. The "permanent" diagram itself can be removed with carbon tetrachloride or other solvent.

algebraic division at the secondary level. The magnetic chalkboard enables the teacher to describe quickly the theory behind equations having to do with areas, perimeters, and circumferences, or the plotting of algebraic equations in graphic form (Fig. 3.13). The hidden chalkboard technique is valuable in time drills on recognition of arithmetic information and on spelling and vocabulary.

The athletic coach may use a chalkboard and permanent ink to lay out the basic floor plan for a game—basketball, for example (Fig. 3.14). He can use one set of symbols to represent the players on a team, another set to show playing strategy. Colored chalk enables him to differentiate between offensive and defensive plays, directions, and action sequences. Perhaps he will use white chalk for key suggestions regarding strategy. By screening part of the chalkboard with an ordinary window shade or a drape,

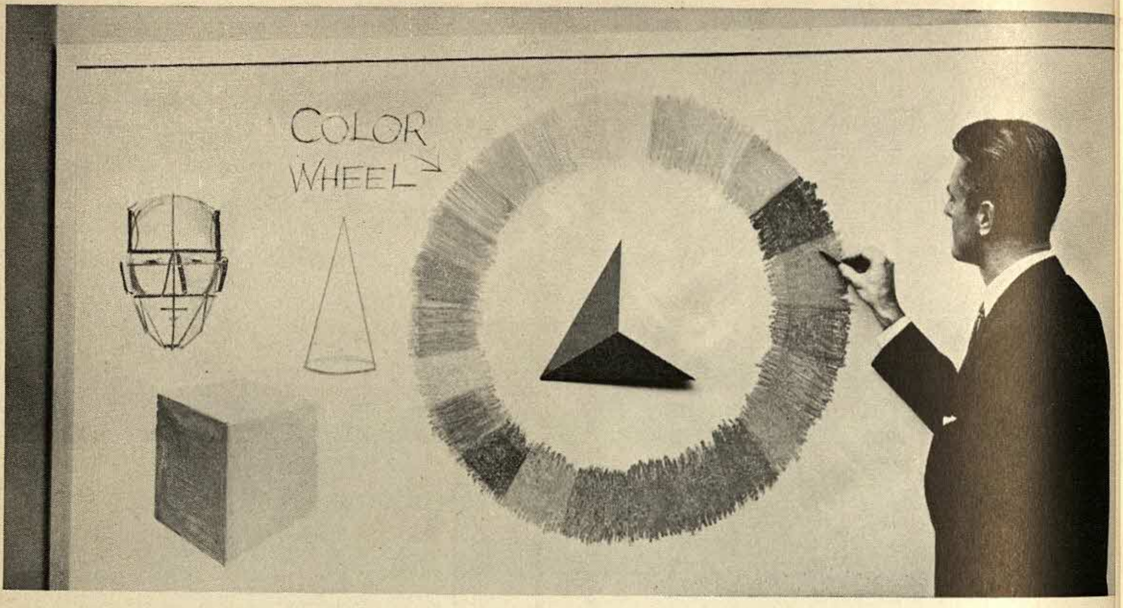


Fig. 3.15. This white chalkboard provides a good surface for soap-base colored chalk. For what subject areas is it well suited?

he can test the players' speed of reaction to typical situations that usually arise during a game. A chalkboard enables him to help the players realize actual game situations which can be discussed at length later.

An extremely recent development in chalkboards is the white chalkboard (Fig. 3.15), which is being installed in increasing numbers of schools that have been constructed during the present decade. Soap-base colored chalk which can be removed easily with a soft cloth or cleansing tissues is used on these boards. Thus the teacher has a realistic means of visualizing color effects in art work, interior decoration, and home economics courses in such fields as costuming and dress design.

As the teacher increases his knowledge of the variety of chalkboard materials and techniques available today, he will wish to experiment with their interrelated use. The uses to which these techniques may be put as a means of illustrating, supplementing, clarifying, and outlining classroom procedures are as varied as the subject-matter responsibilities and grade levels of the modern school. At one extreme may be the visualization that tells a complete story and may become the core activity around which an entire discussion may revolve. An exploded drawing, for example, which shows the piece-by-piece structure of a modern aircraft may become the focal point of attention as the junior-high-school teacher explains the structural functions and parts and relates each to the specific vocabulary the students will learn from the discussion.

The chalkboard may be used in relation to other teaching materials such as models, experience charts, and flash cards, all of which ultimately create relationships and understandings of the symbols and of the objects for which these symbols stand (Fig. 3.16). Through this type of interrelated use of the chalkboard, the primary teacher effectively encourages reading comprehension.

The chalkboard can become an accessible medium for tabulating community geographical features in symbolic form (Fig. 3.17).

Some advantages of using a chalkboard in the learning process are:

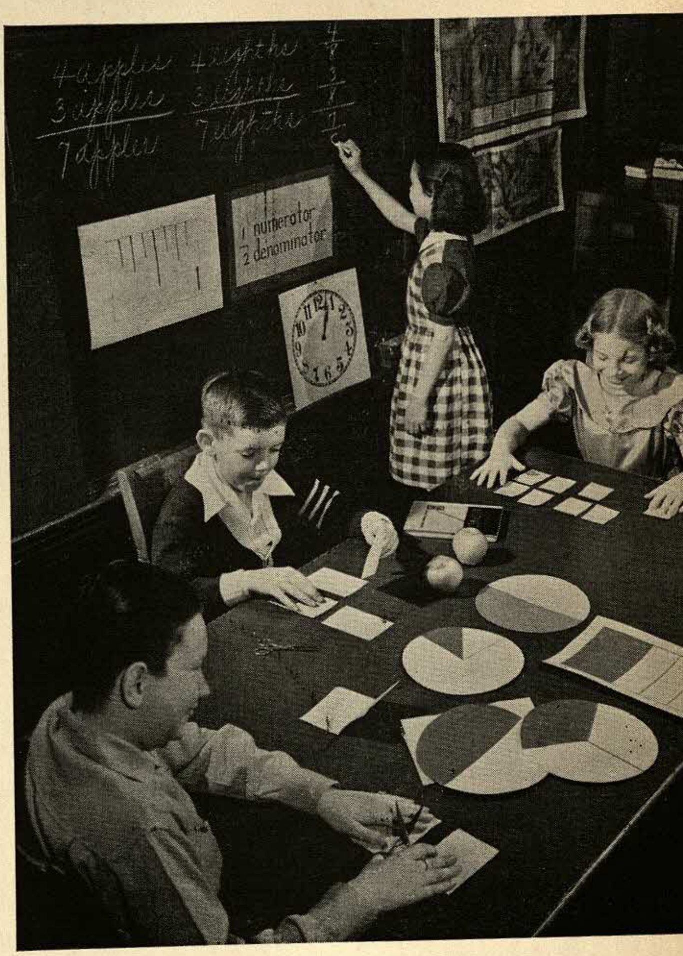


Fig. 3.16. The chalkboard is used to summarize experiences. Its use with charts and models heightens interest.

1. The chalkboard can become an integral and valuable part of pupil-teacher planning.
3. The chalkboard is useful in recording progress by documenting trial-and-error approaches to subject-matter responsibilities.
4. The chalkboard makes possible quick change and rearrangement, both valuable in documenting developmental thinking.
5. The chalkboard may become the medium through which group projects are worked out. Group projects in the social studies, art, arithmetic, nature study, history, and in other subjects can be planned, illustrated, and summarized by means of chalkboard techniques.

EVALUATION

Since the orderly use of the chalkboard must at some time be evaluated in terms of the opportunities it affords for improved teaching, the suggestion is

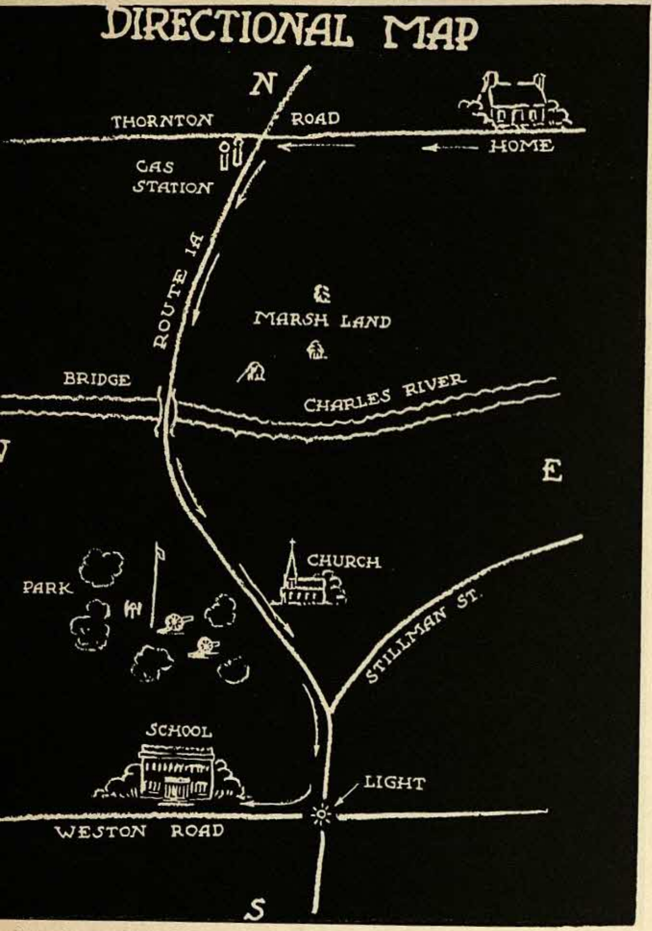


Fig. 3.17. The chalkboard is used to begin map understandings.

made here that after a chalkboard demonstration, explanation, or assignment, pupils and teachers join in discussing its effectiveness.

Basically, chalkboard teaching techniques are good or ineffectual in terms of whether the use of the chalkboard contributes to higher levels of understanding, interest, and subject-matter accomplishment. For this reason, it is suggested that the following items be used as at least one means of evaluating chalkboard use.

Chalkboard Techniques

1. Did our use of the chalkboard illustration help us in the work we are doing? Yes .... No ....
2. Did the chalkboard information present a learning opportunity which was beyond that available with more accessible, more easily arranged materials? Yes .... No ....
3. Did the whole class (where possible) help in creating the chalkboard display, each in terms of his own interest and ability? Yes .... No ....

Mechanics

1. Was the chalkboard display free of glare? Yes .... No ....
2. Was the chalkboard display uncluttered, pleasing in appearance? Yes .... No ....
3. Was it organized around the focal point of interest? Yes .... No ....
4. Were titles neat, and headings, captions, and phrases meaningful and as brief as possible? Yes .... No ....

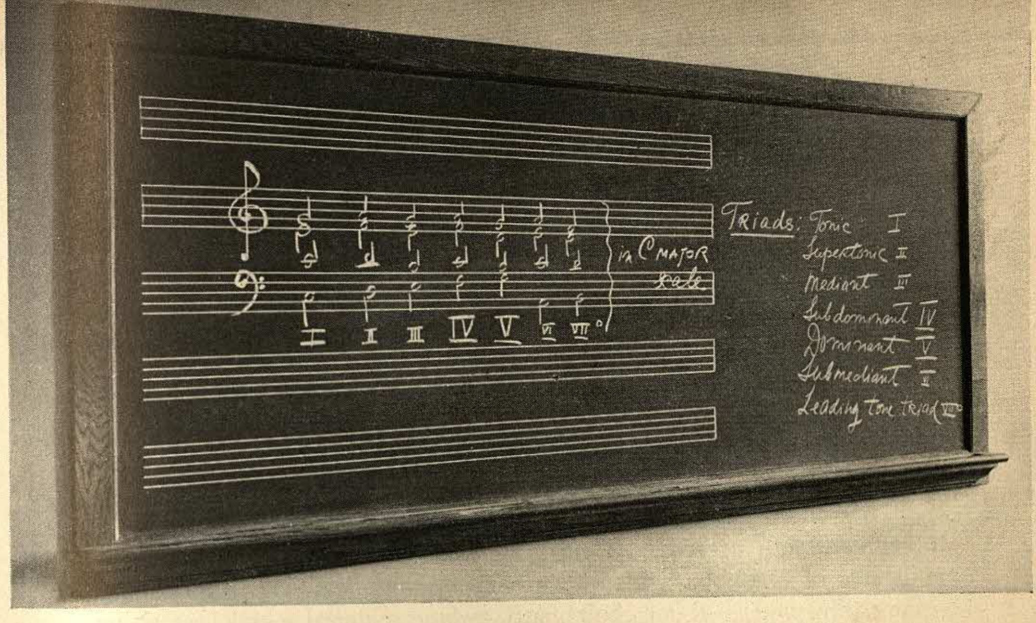


Fig. 3.18. These lines are actually silk screened in place. This is an example of how permanent reference lines may be affixed in specific needed chalkboard situations.

SUMMARY

No teacher need say, "I'm interested in visual instruction methods, but my school doesn't give me any money for them."

Any interested teacher can begin a program of improving instruction by becoming a more effective user of chalk and chalkboard.

The chalkboard (blackboard) is one of the oldest graphic or visual instruction devices. The earlier slate blackboard has now been replaced by white, green, or yellow satin-surfaced or glareproof glass or plastic chalkboard.

Chalkboard materials for writing, drawing, and illustrating should be available to every classroom teacher. These include white and colored chalk, rulers, compasses, templates, patterns, stencils, etc.

Although many teachers feel that they have to be gifted artistically to use chalkboard visualization, this is *not* the case. The teacher-artist has a natural advantage, but there are many techniques of chalkboard teaching which can be easily learned by any interested teacher. These include:

1. Careful selection of usable chalkboard space, attention to size of letters, use of properly prepared chalk, etc.
2. Use of printing, proper spacing, guide lines, etc., to increase legibility and therefore understandability.
3. Preparation of patterns or templates when outline maps, diagrams, scales, etc., are used repeatedly.

4. Use of the grid method and the opaque projector in transferring useful but hard-to-draw diagrams, charts, pictures, etc.
5. Use of the hidden drawing technique to add flexibility, imagination, and high interest to chalkboard teaching.
6. Mastery of elementary stick figure or cartoon technique for dramatizing and imparting interest to chalkboard teaching.
7. Use of the magnetic chalkboard in creating movable three-dimensional charts, maps, floor plans, layouts, etc.

The chalkboard is a universally "available" teaching device. With reasonable study and practice anyone can learn to use it effectively.

Suggested Activities

1. Page through professional education magazines and locate names and addresses of chalkboard manufacturers and suppliers. Write to them for current information about chalkboard surface material, chalk, templates, compasses, rulers, etc. Prepare this information as a "source" list for future reference. (Also consult the Source Lists on pages 477–478.)
2. As you observe your critic teacher, fellow practice teachers, or colleagues in their teaching assignments, list the possibilities you find for the improvement of study situations through chalkboard use. Under the heading "Chalk Talk Opportunities" note how diagrams, instructions, special illustrative explanations, etc., might have helped to answer pupil questions or have been short-cut and time-saving devices.
3. As you prepare lesson plans, sketch in chalkboard teaching ideas. Report on the success of these diagrams, graphs, or other pictorial explanatory devices after you have tried them out in teaching situations.
4. Demonstrate how to select and prepare a chalkboard panel for use in the classroom in which you meet to study visual instruction. Demonstrate your ability to handle problems of glare, size of lettering, care of chalkboard surface, erasing, freehand line and circle drawing, etc.
5. Show your ability to heighten interest in chalkboard illustration through your use of stick or cartoon figures.
6. Make a chalkboard ruler, compass, pattern, and template. Show how you will use them in connection with the subject you teach or will probably teach.
7. Using suitable graphic subject material, enlarge and transfer a small drawing or picture to a chalkboard by means of the grid method.
8. Discuss the problem of visibility. Include seating, angle, light sources, printing size, use of chalk, correct width and sharpness of chalk.
9. Discuss the use of color in chalkboard illustrations related to your special subject interest or responsibility.
10. Arrange to view the film, *Chalkboard Utilization*, Sound, B&W, 16 min., Young America. Discuss ways you can adapt to your own teaching use the various techniques and ideas in this film.

11. Arrange to view the Wisconsin AV/TV Series Lessons 5 and 6, The Chalkboard. These 30-minute kinescope lessons are available through the Bureau of Audio-Visual Instruction, University of Wisconsin, Madison 6, Wisconsin.

Bibliography

Dallman, A., "Birds and Their Habitat in Posters and Borders," *Grade Teacher,* May, 1950, pp. 38–39.

Grassell, Milton E., "Chalkboards in Action," *Educational Screen and Audio-Visual Guide,* August, 1959, pp. 400–401.

Kable, L., "Chalkboard: Number One Visual Aid," *National Education Association Journal,* May, 1948, p. 306.

Kinder, James S., *Audio-Visual Materials and Techniques,* American Book, 1950.

Kleinschmidt, H. E. *How to Turn Ideas into Pictures,* National Publicity Council for Health and Welfare Services, Inc., 1950.

Ramshaw, H. G., *Blackboard Work,* Oxford Univ. Press, 1955.

Shannon, J. R., "Economics and Aesthetics of Chalk," *American School Board Journal,* October, 1948, pp. 55–56.

The Care and Cleaning of Chalkboards, Weber Costello, 1957.

CHAPTER 4

FLAT PICTURES

A JUNIOR-HIGH-SCHOOL CLASS is discussing what the social studies teacher calls a "projective" picture, namely, a picture which projects an emotional atmosphere or feeling.[1] He uses, in this instance, a picture showing a judge, a policeman, a boy, and a woman together in a courtroom (Fig. 4.1). After looking at it a minute or so, the students describe the scene as one in which the boy is facing some kind of serious charge for a crime he has committed. Here are some of their analytical comments:

"Nobody seemed interested in the boy or understood him. In fact, not many adults understood us."

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[1] Raymond H. Meussig, "Using Projective Pictures," *Education,* May, 1958, pp. 258–260.

"The mother isn't angry. Instead she's disappointed . . . disappointed in herself and her boy. She blames herself as much as she does her son."

"We have to have certain limits. Even though we call this a 'free country' we are talking about freedom with responsibility."

A penetrating discussion of something important is under way here. . . .

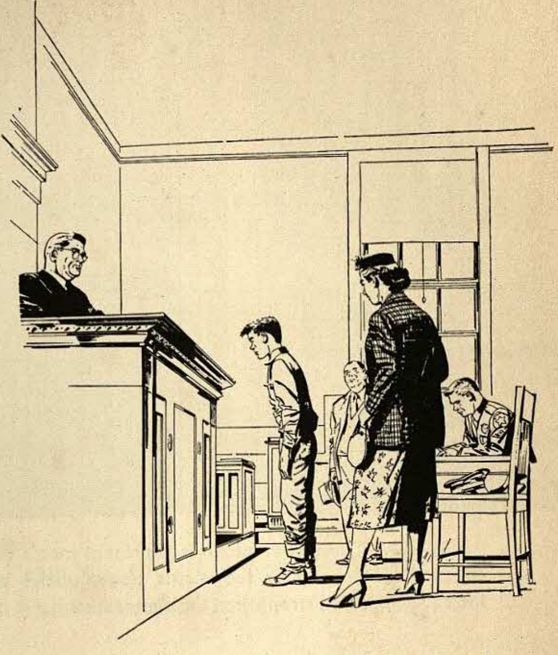

Fig. 4.1. Pictures can communicate visual facts rather readily. Does this picture do something more? How and where might it be used to advantage?

In another classroom, a group of junior-high-school pupils is discussing the subject of advertising. The teacher places one of a series of colorful soap advertisements in the opaque projector and the students gaze at it intently.

"What have you noticed about each of these ads?" asked Mr. Johnson.

"They all have a good-looking girl in them," volunteers Joe.

"Each calls itself the best or kindest to your skin," adds Mary.

"They're all kind of attractive," another boy says.

"They all use words like 'best,' 'most suds,' 'creamy,' 'soft,' 'fluffy,' 'snowy,' 'pure,'" adds a fourth pupil.

"It looks as if everyone tries to find the best picture they can think up so as to attract attention to their ad, and all use the same kind of descriptive words. It makes you wonder how can all be best—are they telling the truth?" another lad sums up.

Thus ideas, leads, questions, suggestions for further activity, high group interest, a challenge to creative thinking—all are stimulated by the addition of a few pictures to a learning experience. . . .

With the coming of spring, a primary reading class eagerly followed Miss Barstow's story about birds migrating back from the southland. The pupils participated enthusiastically in planning a field trip to a nearby park in order to *see* some of the spring birds they had been reading about. As an additional stimulus Miss Barstow showed a film about robins and used a number of good pictures brought in by the pupils. As free "reading" she had several

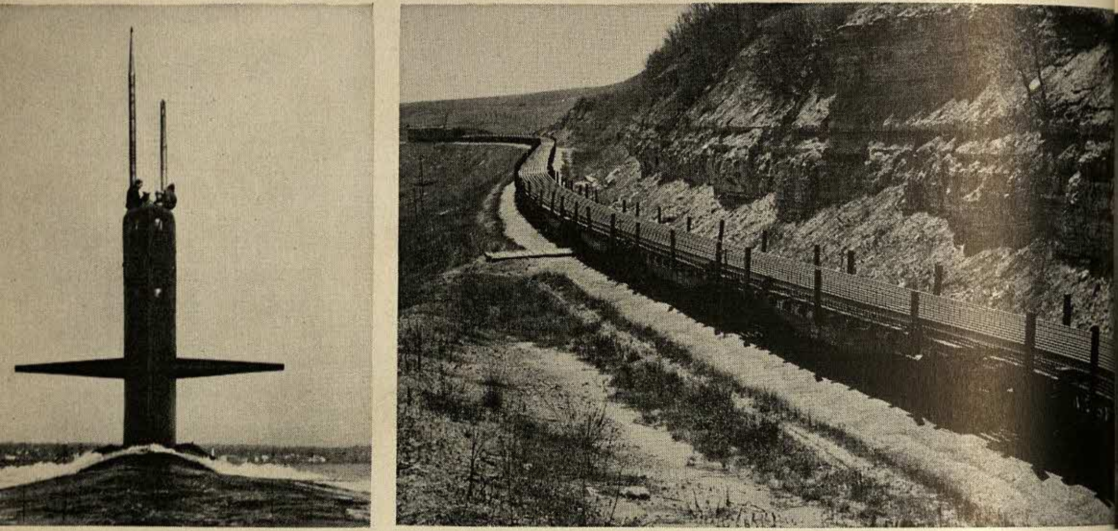

Fig. 4.2. These four pictures represent man's achievements on sea and land, in the sky and in space. What are your judgments about each? What learning qualities does each have? Does their juxtaposition strengthen their message?

sets of colored stereographs showing many birds in their natural surroundings and in striking three-dimensional realism. "Robins," "bluebirds," "blackbirds," "swallows," "wrens"—these names came to have vivid meaning as pictures, stereographs, and firsthand seeing gave the words meaning in terms of the child's experiences.

COMMUNICATION WITH PICTURES

The examples above illustrate what good teachers sense instinctively—that pictures can arouse interest, stimulate discussion, raise questions, supply information and ideas, and otherwise contribute to learning. The picture is a form of communication that has certain attributes of its own. It is worth our while to examine these attributes since they can help us to understand the why, the what, and the how of using pictures in teaching.

There are many forms of pictures. They are familiar to us as photographs, drawings, or paintings of numerous types. We have still pictures and motion pictures. Some pictures are projected as transparencies; others appear as opaque flat pictures like those in this chapter. Pictures in magazines and newspapers, study prints, and photographs also belong in the category we call flat pictures.

Although many of the characteristics of flat picture communication apply to other types of pictorial presentation, it will be helpful to begin by con-

sidering flat pictures by themselves. Later we shall see how some of these characteristics apply also to slides and filmstrips, motion pictures, television, and other visual forms.

ADVANTAGES OF THE FLAT PICTURE MEDIUM

Both practically and psychologically, flat pictures have many advantages for teacher and students alike. Their ready availability in large numbers at little cost, for example, is an advantage. Pictures cover an infinite variety of subjects. Almost anything we can see can be pictured. Good pictures also attract attention, arouse interest, and clarify meanings. In short, pictures communicate. We now examine some of the concepts involved in communication by pictures.

Universality of Pictures. Pictures are sometimes referred to as a "universal language." Although this statement does not hold strictly true for people who have had little or no experience with pictures, such as tribesmen in remote areas of the world, it is generally true for our students and others with whom we wish to communicate. They are familiar with pictures and can understand them.

This does not suggest that everyone receives the same impressions or the same information from a picture even when he understands it. The ability to "read" pictures varies widely. Interpretations of pictures are influenced by the viewer's past experience with pictures and by his own cultural and social backgrounds. But in spite of this, most pictures convey a much more real and concrete impression than words do. Nothing approaches the effec-

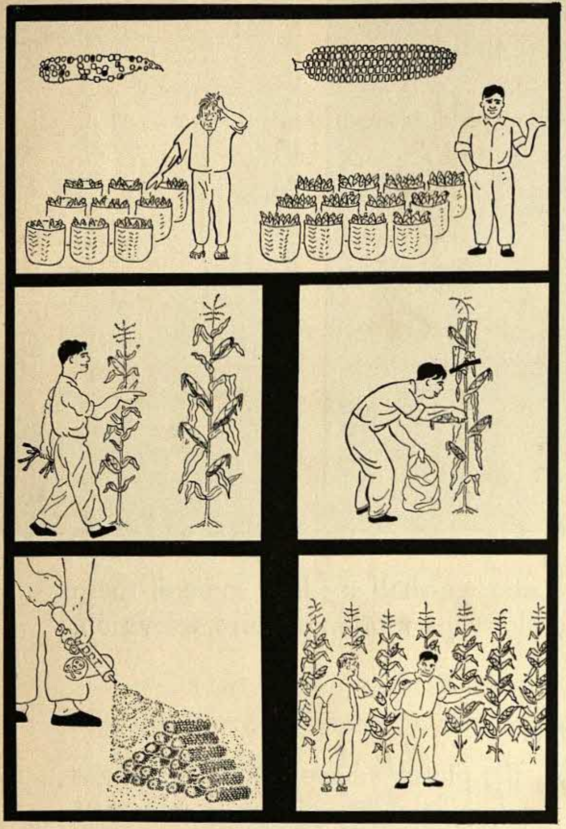

Fig. 4.3. Five of the 23 scenes in a wordless pamphlet designed to improve seed corn selection by illiterate farmers in Venezuela.

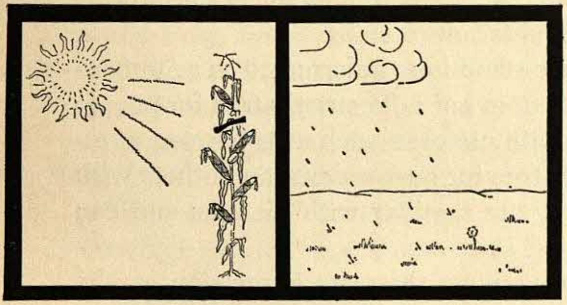

Fig. 4.4. Portions of the wordless pamphlet—for example, the symbols used for the sun and for rain—failed to communicate.

tiveness of pictures as a communications medium which to some degree can overcome language and cultural barriers around the world. This is one sense in which pictures can be considered a universal language. Another is the universality of subject matter which can be portrayed in photograph, illustration, or painting (Fig. 4.2).

It is becoming more common, fortunately, for students in the United States to learn another language in addition to English. But there are hundreds of languages in the world, and over 2000 distinct dialects. Hence we need other means than language to convey the lessons of freedom, health, and technical development to these peoples and to learn from them their way of life. Only by learning much more than we and they now know about other peoples of the world can we help them and ourselves maintain a free world. Pictures are an important medium for international education.

The communicative value of pictures is well illustrated by a study made in Venezuela by the American International Association.[2] A wordless pamphlet (Fig. 4.3) consisting of 23 simple line drawings showing proper methods of selecting seed corn was distributed to 921 farmers in seven different zones of Venezuela. These farmers could not read or write and a number of different dialects were spoken in the seven zones. The customary techniques of mass communication were thus impossible.

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[2] *Analysis of the Wordless Pamphlet on Corn Seed Selection,* American International Association, San José, Costa Rica, 1957.

An initial survey was made to determine which methods of selecting corn seed similar to those presented in the pamphlet were already being used by these farmers. The farmers' understanding of each of the drawings in the pamphlet was then appraised before and after explanation by an agricultural agent.

The survey showed that 42 percent of the farmers understood the pamphlet without further explanation, but that 90 percent understood it after explanation. Analysis by individual pictures indicated that in six instances better pictures would have improved the results. In several of these pictures, for example, many of the farmers did not understand the symbols used to represent the sun and rain (Fig. 4.4).

Two points are worthy of note here. The first is that a simple and imperfect pictorial communications device could be as effective as this one was in an inherently difficult communications setting without verbal interpretation of any kind. The second is the more than 100 percent increase in effectiveness when verbal explanation was added. Seldom do we communicate effectively through a single channel even when conditions are favorable. Thus, words with pictures are usually better than either words or pictures alone. Similarly, *combinations* of appropriate visual and verbal materials are required for an effective job in many teaching tasks.

Versatility of the Picture Medium. Pictures can do many things for us. Like other pictorial media such as films, television, and slides, flat pictures can overcome time and distance by bringing historical scenes and far places into the classroom. The range of subject matter which can be presented through pictures is almost unlimited. Fig. 4.2 is a small sampling of the many types of subjects which flat pictures can represent. Like other visual media, flat pictures can enlarge or reduce scenes that cannot otherwise be seen by the unaided eye. But in addition they have certain distinct advantages of their own.

1. *Flat pictures are readily available in large numbers at low cost.* They are all around us in books, magazines, and newspapers. The many sources and vast numbers of pictures available at little or no cost is a significant practical advantage to teachers with limited funds for instructional materials. Teachers in poor school districts can and do have excellent picture files of their own. This is a valuable resource for all teachers regardless of other materials that are also available to them. Furthermore, fine sets of carefully selected study prints can be purchased (Fig. 4.5). These sets are based upon representative curriculum units and include manuals, descrip-

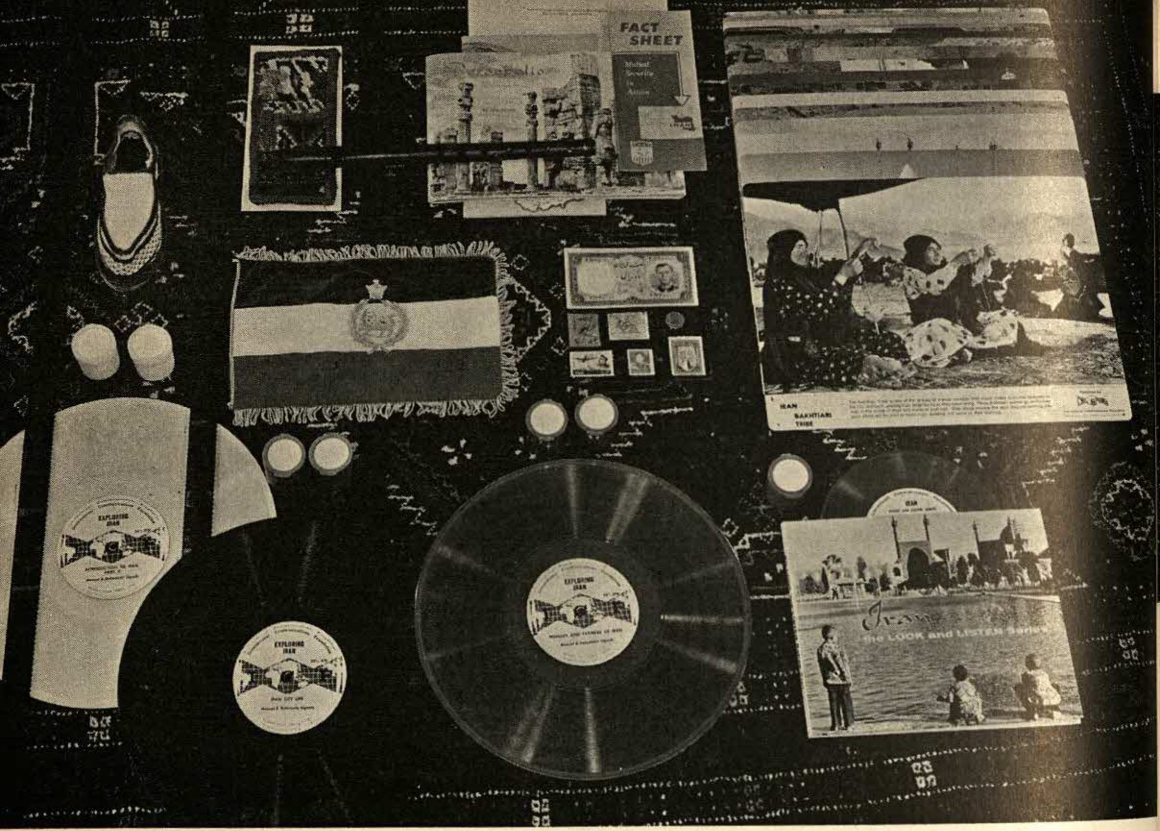
Fig. 4.5. Picture sets are valuable tools, particularly when combined with related instructional materials.

tive information about each picture, and related instructional materials. (See page 487 for both free and commercial sources of flat pictures.)

2. *Flat pictures are well suited for individual and small-group study.* Many of the visual forms we deal with are designed principally for use with groups. Flat pictures, however, are ideal for individual use. The student can examine them for as long or as brief a time as he wishes. He can study pictures like those in Fig. 4.6 for detailed information about nebulae or get an idea of malaria control requirements in Thailand from a series of photographs, one of which is shown in Fig. 4.7. Picture collections are also a useful resource for student committees working on group projects, reports, or displays.

3. *Flat pictures are ideally suited for study displays.* A unique strength of flat pictures is their particular appropriateness and effectiveness in study displays, which are now widely used at upper as well as lower age levels. Although graphics, three-dimensional objects, and other study materials are also used to advantage in study displays, we think of pictures as inherent

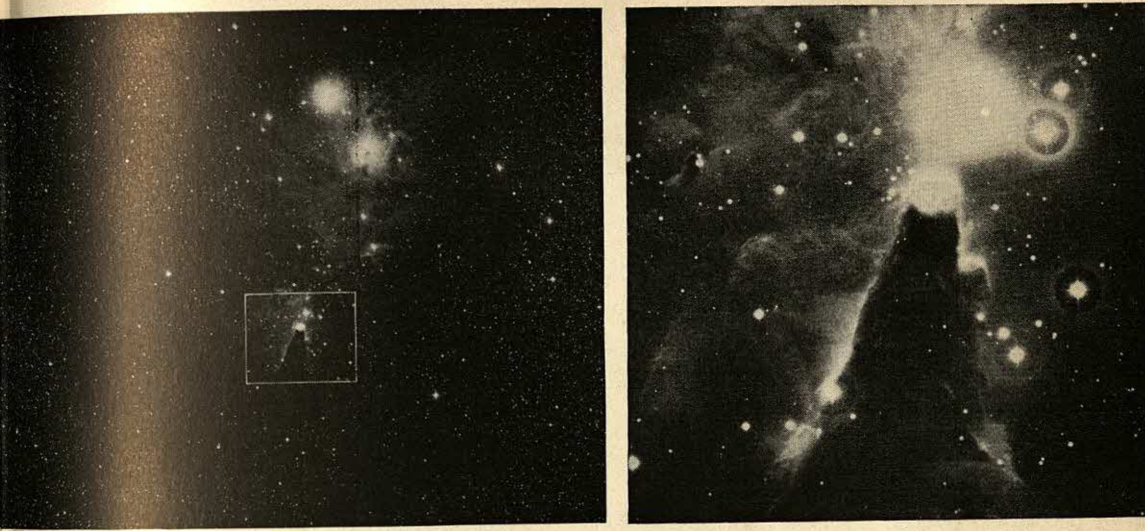

Fig. 4.6. A nebula as seen by the 48-inch Schmidt telescope on Mount Wilson is photographed by the 200-inch "Big Eye" on Mount Palomar for detailed study.

parts of most of them. Displays make good use of the motivational power of pictures that are carefully selected and well presented. (The design and creation of effective study displays is discussed in some detail in Chapter 6.)

LIMITATIONS OF FLAT PICTURES

All teaching materials have advantages for some kinds of teaching tasks and limitations or disadvantages for others. Just as you become skilled at selecting suitable reading materials, so should you become competent in choosing audiovisual materials which will be most effective for each lesson. In part, this choice depends upon the inherent strengths and limitations of the various available materials; in part, on your teaching purposes; and in part, on your method of use. Let us examine some limitations of flat pictures with these factors in mind.

Most pictures are small. The value of flat pictures for individual or small-group use and for study displays has been stressed. But the vast majority of the pictures in books, magazines, and newspapers are too small to be used effectively in front of a class. Unless enlarged or projected by some means, they simply cannot be seen well enough by everyone in the class to justify using them in this way. Hence size is an inherent limitation for one type of use.

However, this limitation can be overcome if an opaque projector and adequate light control facilities are available. Moreover, study prints can be obtained that are large enough to be used in front of the classroom provided attention does not need to be focused on small details in the pictures. Size is not necessarily a limitation in study displays, because if the overall effect of the display is good enough, students will go up and examine it—and the small pictures—at close range.

Flat pictures are inherently two-dimensional. When accurate perception of depth is essential to learning a particular concept or skill, a model or the object itself may be preferable to a two-dimensional flat picture. Thus stereo pictures are used in medical schools, along with models and laboratory dissection, to insure accurate understanding of the precise relationships of bodily tissues. The Army Map Service uses precision instruments in matching flat aerial stereo photographs that provide a basis for accurate contour maps of strategic areas. Technicians' manuals frequently contain complex pictures of the assembly or disassembly of a machine. In these cases where depth perception is of critical importance, flat pictures are used as supplementary rather than primary sources of information. Other visual forms plus considerable experience on the part of the viewer are necessary if he is to read picture depth correctly.

Fig. 4.7. A shaven-headed priest watches a government worker spray temple walls in a highly effective malaria control campaign in Thailand. The priest's comment: "Science and religion are one when they work for the good life."

Few classroom situations require accuracy of depth perception to such a degree as those just mentioned. For most purposes, flat pictures provide adequate impressions of depth. Note how the illusion of depth is created in Fig. 4.8 by such means as converging lines, the reduced size of background objects, highlights and shadows, and decrease in contrast of background colors. Because depth adds realism and lifelike quality to most scenes, artists and photographers strive to achieve a three-dimensional effect. Examine other pictures in this chapter in which depth is important and note how well and by what means it has been achieved.

For scenes with which the observer has some familiarity—to which he brings a sufficient degree of experience—the above techniques provide the cues that enable him to sense rather accurately the actual depth in the scene that is pictured. When scenes contain few familiar elements, however, the accuracy of one's depth impressions may be considerably reduced. Thus the vastness of the Mesabi open-pit mine is extremely difficult to grasp from a picture until a person has actually seen the mine (Fig. 4.9). Youngsters who have never seen mountains or skyscrapers have difficulty in sensing their true dimensions from flat pictures.

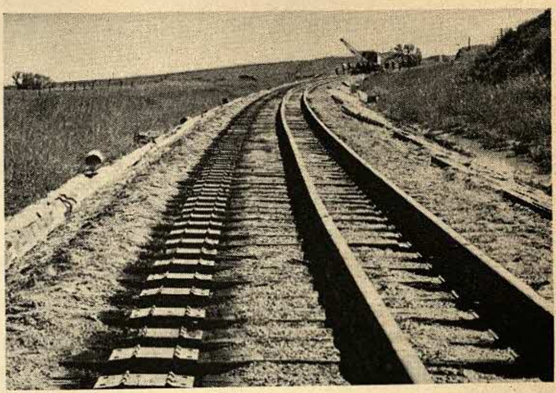

Fig. 4.8. Continuous lengths of welded rail are used to smooth out the ride and reduce maintenance of rolling stock. What gives this flat picture its strong impression of depth?

Flat pictures are a "still" medium. Flat pictures are sometimes called "still pictures," as indeed they are. We use the term flat pictures, however, to discriminate between projected and nonprojected pictures, and between opaque pictures and transparencies. Flat pictures are nonprojected and opaque. They are also "still" in the sense that they are motionless.

One of the more suitable applications is accordingly the still scene. Such scenes as landscapes, mountains, forests or trees, buildings, objects, animals or people in a still position (Fig. 4.11) are natural subjects for flat pictures.

There is an implication for teachers in this characteristic of motionlessness in flat pictures of all types. It is that *they are well suited to the teaching of concepts in which motion is not important to understanding.*

Here again, however, we sense at once that this implication is true only in relative terms. For still pictures can depict motion very satisfactorily for some purposes. The question of whether and how they will be used to teach concepts involving motion depends both upon the past experience of the viewer and upon the specific purposes the teacher has in mind.

If the class is studying about India, for example, the pupils may have seen one or more good motion pictures showing how people live and work on farms and in cities in India. The class will thus have some concrete ideas about the ebb and flow of life in India, the pace of movement, the meaning of teeming populations in the cities, and life in a village family. At this point, a series of still pictures will serve well to further enrich the pupils' understanding.

Still pictures will be helpful even without the films; but their value is increased when the student has seen such things as people and carts in motion, the plodding gait of the water buffalo as it pulls the plow, a woman pounding rice into flour in a stone mortar. Having seen such scenes "live," the pupil can more readily read necessary concepts of motion into still pictures of similar subjects.

Flat pictures of moving subjects also have great value when they are used for study purposes that do not involve motion. Thus, stop-motion photographs of a high jumper may help analyze good points or flaws in his form just as he clears the crossbar (Fig. 4.12). Identification of machine parts is better done with still than motion pictures; the reverse would usually be true if the purpose is to explain how the machine operates.

As you become better acquainted with the picture medium, perhaps you realize more clearly that the communications values of flat pictures in instruction depend upon a variety of interrelated factors. Some of these factors are inherent in the nature of the medium. Others equally important—your purposes, intended methods of use, and the viewers' previous experience—are external factors over which you have more control. Both types of factors help you decide whether to use flat pictures in a lesson, which ones to use, and how to use them.

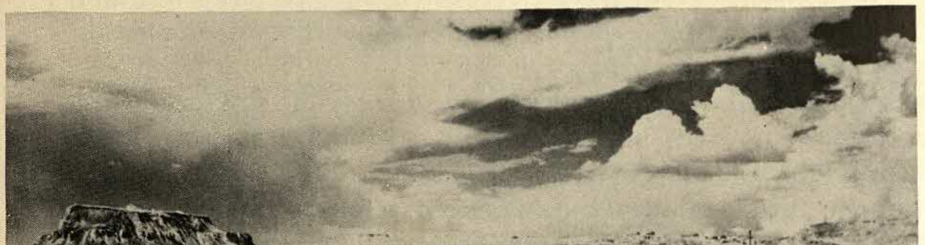

Fig. 4.9. The vast Mesabi open-pit mine is difficult to photograph. As you look at this picture, what impression do you receive? Is the picture effective? Does it convey accurate, clear impressions or is there some confusion? Does it please you? Why or why not? Now look at Fig. 4.10 and ask the same questions. How do the pictures compare in your judgment?

SELECTING PICTURES FOR TEACHING

"Having determined that flat pictures are appropriate to a particular lesson or unit for your class, what guideposts have you found useful in selecting the specific pictures to use?" This question, asked of many classes of experienced teachers over a period of years, has elicited numerous helpful suggestions which fall into two principal types. One has to do with the suitability of pictures in terms of teaching purposes and age level; the other, with picture quality. This is a convenient classification for a discussion of picture selection.

SUITABILITY FOR TEACHING PURPOSES

An intermediate-grade teacher who seemed to have a particular appreciation for good teaching pictures said: "I had used pictures for more years than I care to admit before it dawned on me that my best lessons with pictures were those lessons where I had the clearest idea of what I wanted each picture to do for the class." This is a good summary of a number of similar statements.

Clarity of purpose. Perhaps you recall how your methods and curriculum instructors stressed the importance of objectives in teaching, how these need to be interpreted—not only in long-range but in day-to-day terms—and how they should help you determine both the materials and the methods necessary to achieve them. Well-defined and specific objectives are particularly helpful in selecting pictures for use in teaching (Fig. 4.13).

Suppose, for example, that Miss Brewster is selecting pictures for a lesson on animals. One of her general objectives is to develop an understanding of how to care for pets; another, to build attitudes on conservation with respect to wildlife in general; a third, to bring out how

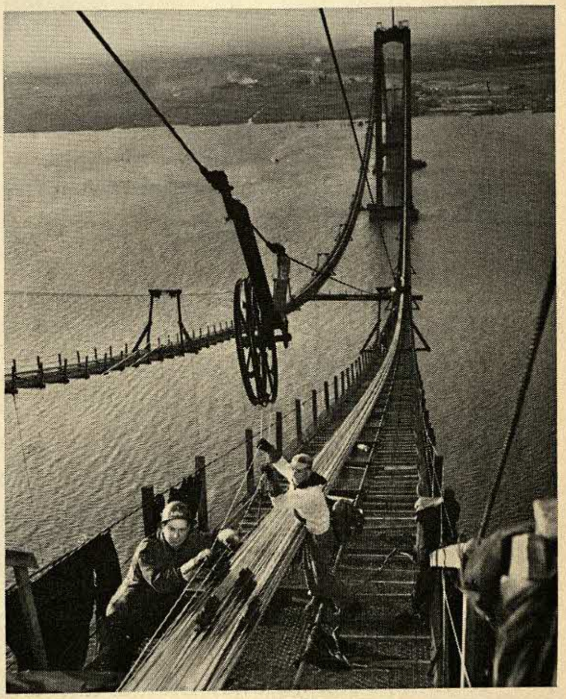

Fig. 4.10. Bridgemen 35 stories above the Delaware River are placing pencil-thick wires in strands for the suspension cable as they come from a four-foot spinning wheel. Is this a good picture for teaching purposes? In what ways besides subject does it differ from Fig. 4.9?

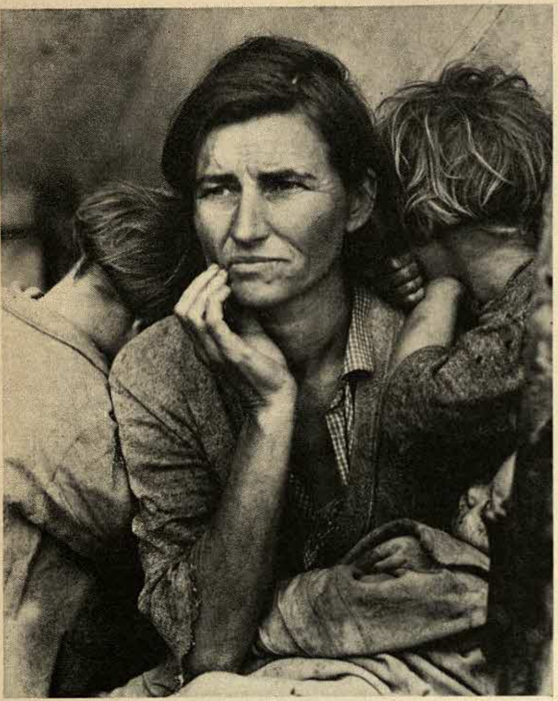

Fig. 4.11. One of the great pictures to come out of the dust-bowl era. What is there about this picture that is exceptional? What emotions does it arouse? What powers of empathy does it have?

animals are adapted to their environment. For this particular lesson, however, she has a specific objective in mind—the identification of several birds which will soon be coming north. She finds a picture of a cat crouching under a tree; a robin has just alighted on a limb of the tree. The picture has a feeling of tense drama, it is extremely realistic and vivid, the colors are excellent, it is artistically good, and it is sufficiently large for the study of detail—in short, it is a fine picture. The only thing wrong is that the whole emphasis is on something other than identifying a robin.

The impact of this picture on the child's mind will be concern with whether the cat is going to get the bird. Miss Brewster wisely passes it by, making a mental note to use it several days later in a lesson on protecting our feathered friends.

She chooses, instead, a close-up shot of a robin in a characteristic pose on the lawn after a rain, its head slightly bent as if listening for worms, and its colors highlighted in the afternoon sun. The first picture is undeniably more fascinating and will get the children's attention, but it will not meet the objectives of that particular lesson as well as the less dramatic picture.

Although students at the high-school, college, and adult levels are more sophisticated than children in their ability to interpret pictures, important general principles of selection still apply. As advertisers are well aware, pictures that are more complex than necessary or that fail to focus sharply on the precise idea to be conveyed do not communicate effectively.

For example, in a study of the effectiveness of pamphlet illustrations on learning among newly literate adults in Costa Rica and Mexico, Spaulding found that woodcut-type illustrations which violated perspective and were not clear-cut in terms of items and actions depicted actually interfered with learning. Thus, in the case of eight of eleven booklets tested, people who read booklets with illustrations recalled an average of 66 percent more information than did those who read the same booklets without illustrations. People who read the two booklets with woodcut illustrations, on the other hand, learned 26 percent *less* than those reading the version without pictures.

"This led us to believe," Spaulding says, "that illustrative material should be realistic, not violating perspective, and that such material should be carefully planned so that each drawing communicates one or two basic ideas. If the illustrative idea does not communicate a clear-cut idea, it will not help to clarify the accompanying text."[3]

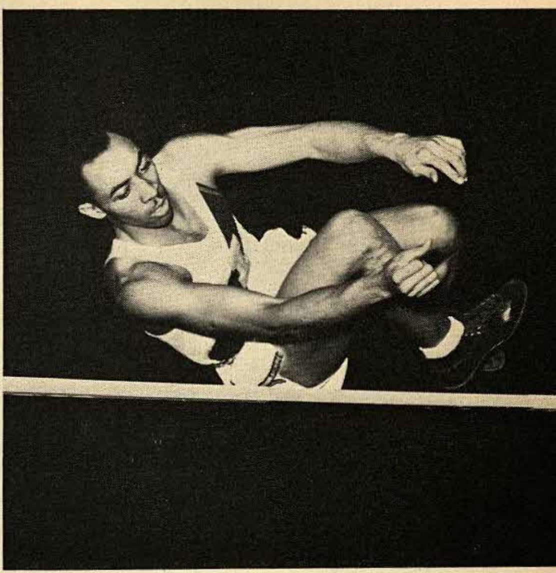

Fig. 4.12. Stop-motion photography enables both coach and athlete to improve performance.

Photographers for *Life* magazine frequently take 50 or more pictures of the same subject to get one that is just right for the purpose. The present authors examined and took many hundreds of illustrations in selecting those to be used in this text. Teachers at *any* level should be satisfied with nothing less than the best pictures they can find. The instructors who are most successful in using pictures are constantly on the lookout for better ones.

Age Level. A further consideration in selecting pictures to fit a specific teaching purpose is age level. Although in most cases this is not a difficult problem, it is well to remember that determining what is to be accomplished in a lesson should not be separated from the question "For whom?" Picture selection according to age level is not as complex as the selection of reading materials. Nevertheless, there must be fewer elements in a picture for young children than in one for older pupils, the pattern must be simpler, the idea less complicated (Fig. 4.14).

This is, of course, quite natural because in terms of his experience the primary child can bring less *to* a picture than can his older brother and sister. To him a picture of an airplane is usually just an airplane, though he has probably learned to distinguish in his own mind between big planes and little ones. His ten-year-old brother, however, will very likely be able

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[3] Seth Spaulding, "Communication Potential of Pictorial Illustrations," *Audio-Visual Communications Review,* Winter, 1956, pp. 31–33.

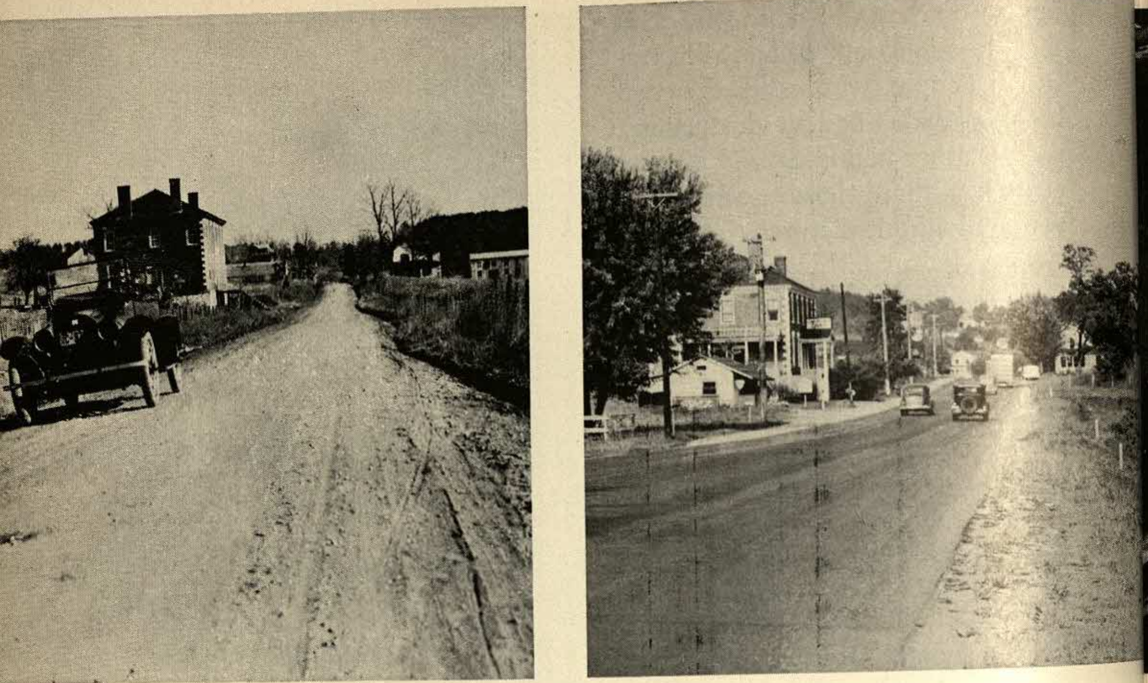

Fig. 4.13. Fifty years of highway development at a glance. Could the concepts embodied here be communicated as effectively by words?

to identify the plane as a jet or a turbo-prop transport and can volunteer information as to its size and the speed and altitude at which it flies.

Evidence showing the importance of selecting pictures suited to age level is reported by French. Using both a complex and a simple, literal version of thirteen pictures, he tested the preferences of 88 elementary-school teachers and 554 pupils in Grades 1 through 5. He found that whereas 89 percent of the teachers preferred the complex versions, 83 percent of the first-graders preferred the simple illustrations. Not until Grade 4 did a majority of the children prefer the complex pictures. Thus French concluded that children show "a logical and consistent basis for their selections" and that they "preferred pictures that were understandable on the basis of their own artistic experience."[4]

Although much remains to be discovered about how we learn from pictures, we know that variations in picture reading ability are due to a combination of factors of which age is only one. Intelligence, environment, prior experience in reading pictures, and imagination all probably play a significant part. Thus it is important for a teacher to consider his pupils'

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[4] John E. French, "Children's Preferences for Pictures of Varied Complexity of Pictorial Pattern," *Elementary School Journal*, October, 1952, pp. 90–95.

abilities, age, and probable experience when choosing pictures for classroom use. In the primary grades he may need to discount his own picture preferences. At any level he will need to determine when a picture has the necessary concepts for his purpose, plus the right amount of detail, the appropriate degree of abstraction, and the other qualities that make it suited to the abilities and interests of his students.

Validity. The effectiveness of a good picture makes it a powerful teaching tool. It is important that the impressions left in a learner's mind be correct and accurate, insofar as the picture can make them so. This means that the photograph, painting, or illustration must provide both a true general impression and accuracy of detail. To accomplish this, the picture in most instances should be typical like that in Fig. 4.15, rather than unique or startling. The unfortunate fact that the unusual scene frequently lends itself to picture making more readily than the ordinary run of events should make the teacher pause and think when considering the factor of truthfulness.

The dramatic, thrilling, or unusually beautiful scene may have its place in the classroom for decorative or motivation purposes, but you convey accurate impressions more readily by pictures that are representative of the area or subject being studied. Thus if for language arts purposes we wish

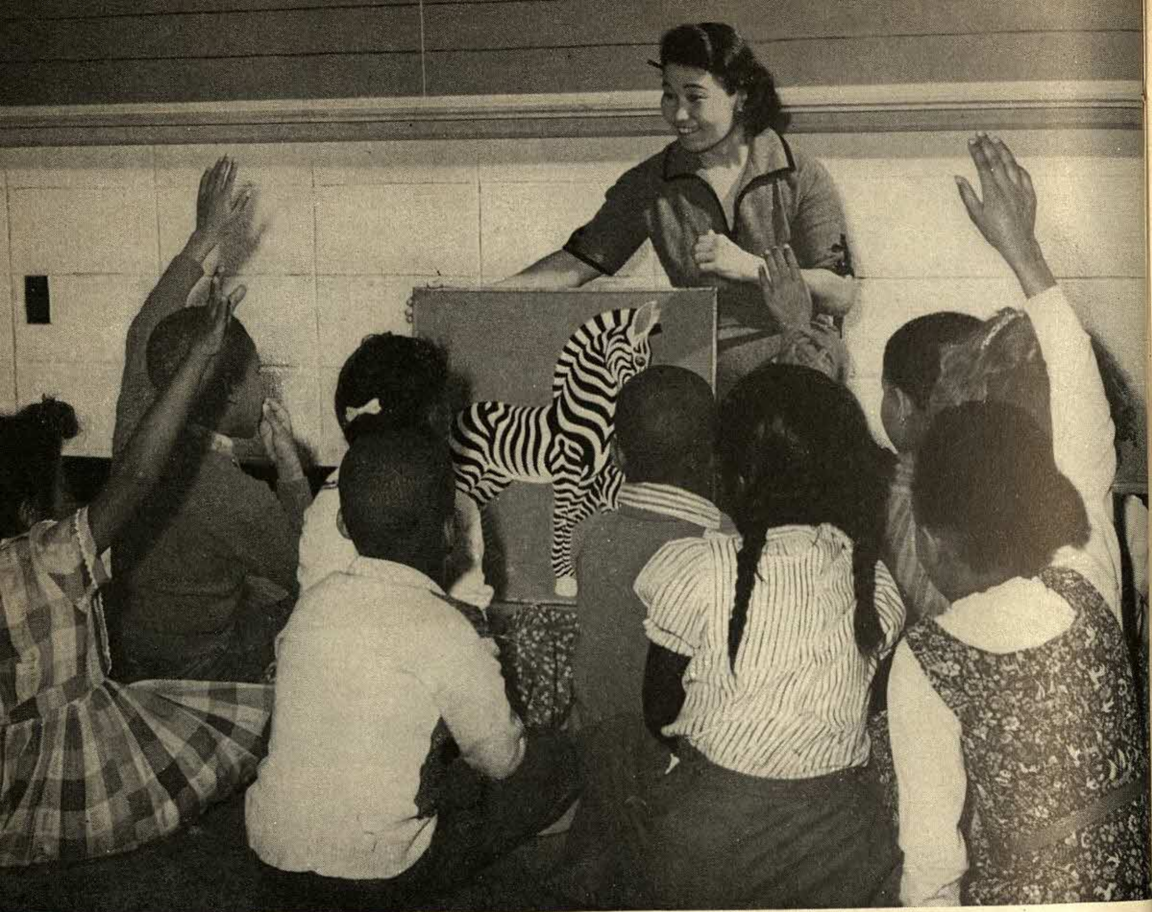

Fig. 4.14. Younger children learn best from pictures that are not complicated.

to show the Hollander of another day with quaint wooden shoes and pantaloons, let us keep such illustrations in a story context. But let our social studies classes see him as he is today on his modern farm or busy city streets, with occupations, interests, and appearance much like those of other western Europeans.

Interest. It may appear somewhat inconsistent to maintain that a picture should be typical rather than unusual and at the same time that it must be highly interesting. Yet interest among learners tends to be attracted by a vast number of ordinary things with which they are familiar. For instance, consider the great interest usually shown by children in pictures of animals or of other children, or of trains, ships, or airplanes. To each of these the child brings some degree of familiarity which helps to arouse his curiosity and to give an outlet to his imagination.

Here again, the purpose for which a picture is used and the intended method of use must be kept constantly in mind. If a picture is to be a focus of attention in a study or advertising display, it must have strong eye appeal or it will be unlikely to be given a second glance. Much of the communications potential of the display will be bypassed before it has a chance to function. Hence in situations where motivation is a primary consideration, a dramatic or unusual picture may be called for.

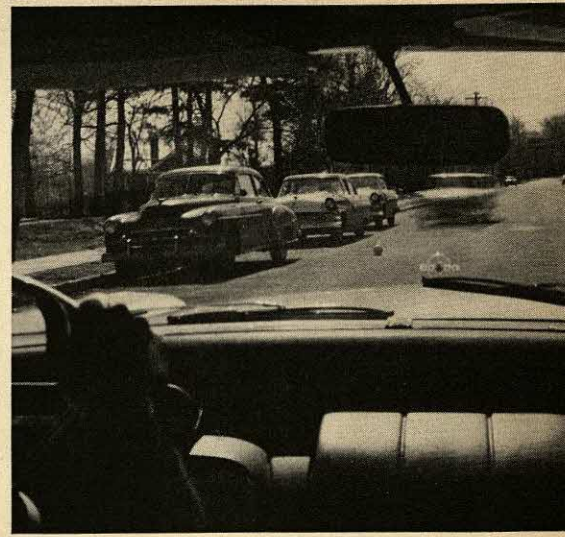

Fig. 4.15. The familiar scene has great teaching potential. There is a cue here that makes this an excellent driver-education shot. What is it?

But once attention has been secured and motivation achieved,[5] interest can be maintained and content objectives attained much better by less dramatic pictures selected because they convey the desired information and ideas better. As a junior-high-school social studies teacher reported, "One of my most successful uses of flat pictures has been in letting project committees work with our picture files. They get a lot of information that way which otherwise I feel might have been missed. And when they report on their projects to the class, they often show a good deal of discrimination in the pictures they select to illustrate their points."

In other words, the quality of "interest" in pictures may be increased as viewers come to know more about the subject represented and as they themselves have occasion to use pictures to express ideas to others.

PICTURE QUALITY

Thus far we have been concerned with the more extrinsic factors of selecting pictures—their pertinence to the teacher's specific purposes in terms of age level, complexity, validity, and ability to motivate interest. These are fundamental. But we need also to be concerned with the intrinsic characteristics of pictures. As one teacher put it:

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[5] Experienced teachers know that motivation can stem from a variety of sources, both internal and external to the learner. Pictures and displays, when pertinent, are one helpful means of arousing or increasing interest among learners. In a display designed for motivation purposes, a large and particularly striking picture may well attract attention. On the other hand, the overall design of the display, the title, the use of color—or some combination of these—may be the primary attention-getting factor. See chap. 6 for further discussion of display techniques.

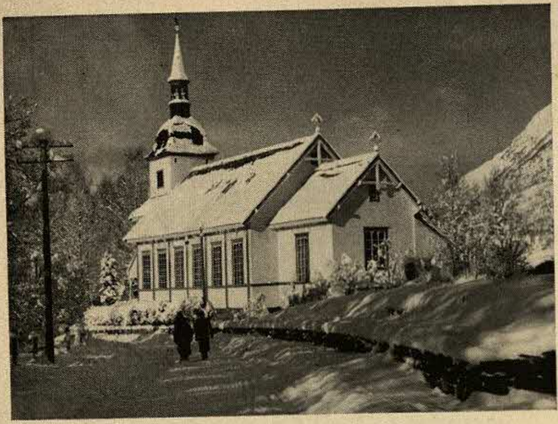

Fig. 4.16. This picture was selected as an example of good composition. What elements make it so?

"I'm a camera fan myself and take a lot of pictures. In the process, I have come to have a great deal of respect for people who can take really *good* pictures. There's a lot of difference between ordinary pictures and good ones and I try hard to find the good ones to use in my biology classes."

What are *good* pictures in the sense meant by this science teacher? And why are such pictures better than ordinary pictures for teaching purposes? An art teacher had this to say about the second question:

"Well, what we're really talking about is visual communication, isn't it? In my art teaching, I try to instill in my pupils an appreciation for such things as color, line, and composition in good pictures so that they can apply these fundamentals as they make their own sketches and designs. But the same principles apply to any visual material which is intended to communicate. The better a picture is from an art standpoint, the better it is likely to transmit what it has to say to anyone looking at it."

In other words, good art and good visual communication go hand in hand. Let us take a closer look at five of the characteristics found in good pictures—good composition, effective color, effective technique, good contrast, and clarity and sharpness. In the process, we can equate these five and one other—size—with the teaching functions which flat pictures can fulfill.

Good Composition. The fundamental characteristic of an effective picture is good composition, or good overall organization, such as is shown in Fig. 4.16. Usually an effective picture has a clear-cut center of interest to which the rest of the picture contributes by such means as the balance of the picture as a whole, the position and direction of lines, and the use of light, shadow, and color. The focus of attention is rarely in the center of the pic-

Opposite page: Too few people have seen the true beauty of this United Nations Trusteeship Council Chamber in the warmth and richness of full color. This picture took 6½ hours to photograph, time exposures being used on the window view in the late afternoon and on the many banks of lights after dark. The photographer used 240 flash bulbs singly in a 3½-hour series of night shots to bring out the various details in the room.

The several distinct centers of interest in this picture are brought together, by a kind of unity, into a pleasing total effect.

ture, a position other than the center being more pleasing to the eye as a rule. The presence or absence of a good center of interest can be readily ascertained by allowing the eye to travel naturally over the picture until it fixes on a point of key interest. Look away from that point, and your eyes tend to go back to it if there is a good center of interest there.

Occasionally pictures of huge crowds, of geometric patterns, or of a large number of similar objects do not have a center of interest in the usual sense. In these pictures the overall effect is the objective—a general impression rather than specific detail. Thus 100,000 people in a public square, row upon row of dilapidated houses, or rolling fields of grain extending as far as the eye can see may have a powerful effect on the observer.

The center of interest in such pictures is an idea rather than a physical thing. Their effectiveness is determined by how well this idea is communicated. A mass subject is difficult to photograph effectively because it does not have a visible center of interest around which composition can be built.

Effective Color. The use of harmonious and effective color is a second mark of good art. Colored pictures selected for use with children should generally be true and natural in color. Color values in nature are seldom primary reds, blues, greens, and violets; rather they are composed of infinite and subtle variations of these colors. Hence, where color is important in a teaching situation it should be as true as possible. (See the accompanying two plates.)

According to Spaulding's study, referred to earlier, color seemed to add to the communication potential of illustrations if it added to the realism, but it detracted if used unrealistically. He also thought that color was valuable in increasing interest.[6]

An exception to the above statements must be recognized with respect to art subjects in which color is used as a dominant means of expressing ideas. Thus children pay little attention to natural colors in expressing themselves in paint or crayons. Trees may be purple splashes, a locomotive a racing giant in flaming red, yet the pictures are highly meaningful to the young artists.

Likewise in observing such pictures, if they are good pictures children seem to experience little difficulty in grasping the artist's idea. For an art class or any other class in which unique or unusual illustrations bring out a particular point well, "impressionistic" pictures of this type may be entirely

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[6] Seth Spaulding, *op. cit.*, p. 42.

Opposite page: Besides strong aesthetic appeal, what does color add to this striking view of the Matterhorn? How does it contribute, for example, to an understanding of the landscape and its vegetation? To comprehension of life and the problems of living on a Swiss mountainside?

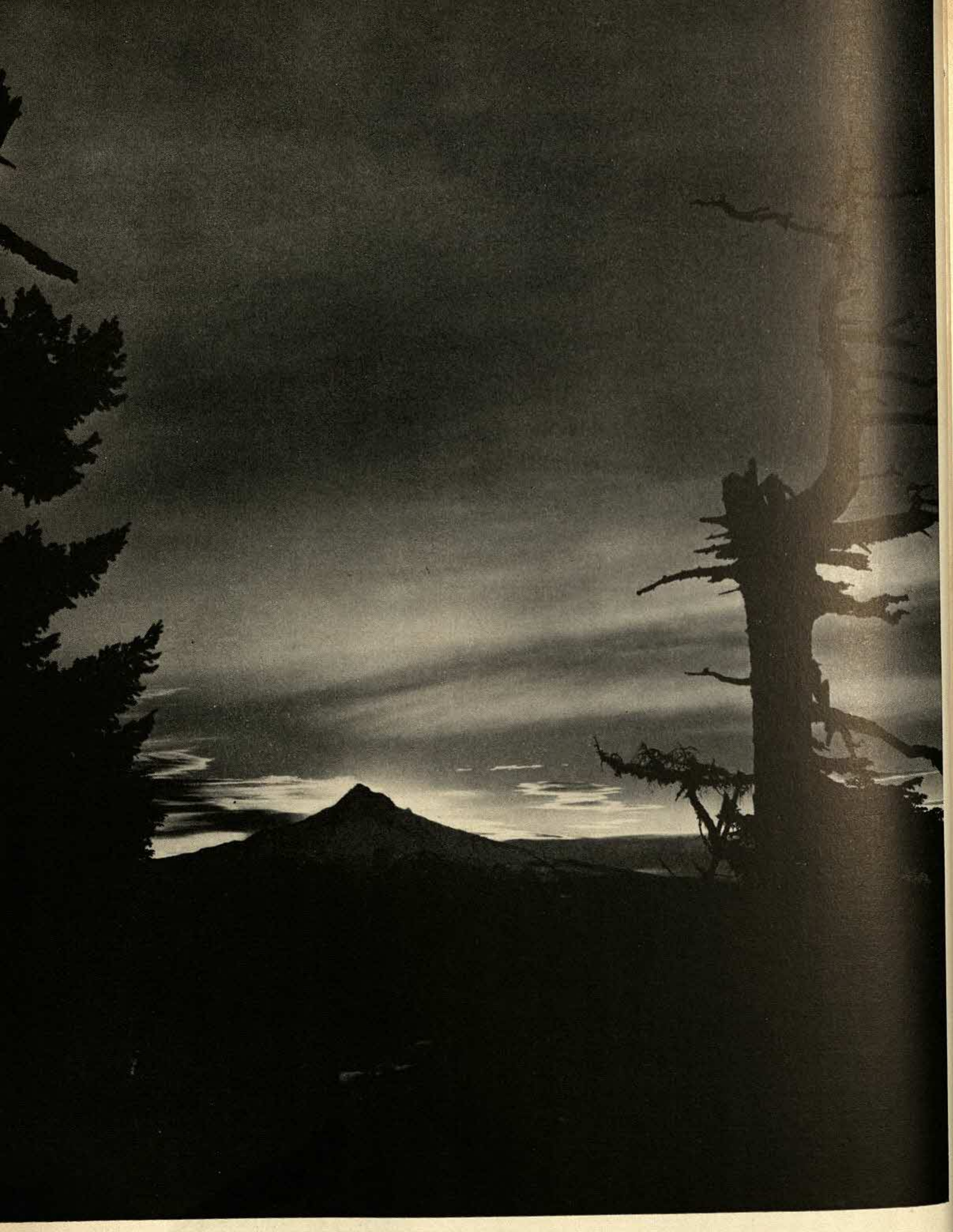

Fig. 4.17. The full range of the gray scale is included in this beautiful shot of Mount Hood at sunrise. Can you see an advantage for some kinds of study in the many subtle gradations in tone which are possible with black-and-white pictures?

suitable. The decision as to whether to use abnormal colors must, of course, be based on the specific purposes of the lesson. Informational concepts are normally conveyed most effectively by accurate color renditions.

Color is a part of our natural environment. Hence good color in pictures adds realism as well as attractiveness to a pictured scene. Illustrations of particularly effective color use are found in the plates facing pages 88 and 89. As color film is improved and as color reproduction processes become more flexible and less expensive, pictures of this quality will be used with increasing frequency in text and reference books of all kinds. The better-illustrated magazines, advertising brochures, and trade journals are already making extensive use of full-range color reproductions.

It should also be noted that black-and-white photography can provide a wide variety of color impressions. Study of the gray scale (a scale of uncolored shades from black to white) suggests the many subtle variations in value that are possible with black-and-white film (see Fig. 4.17). Because of its greater flexibility, many photographers prefer working with black-and-white film whenever color is not an essential element of the picture. For the same reason, it is often well for the teacher to select good black-and-white photographs rather than mediocre colored pictures, particularly when color is only incidental to the subject being taught.

Effective Technique. A third characteristic of good pictures is that the technique used by the artist or photographer is effective. More so than is true of composition and color, technique may be and frequently is a highly individual matter. A person with only a casual artistic acquaintance has little difficulty in recognizing the distinctive quality of a painting by Van Gogh or Rembrandt. Likewise, a student of photography soon learns the unique characteristics of the work of outstanding photographers. The important point in selecting pictures for classroom use is that the technique contributes to the picture's communicative value for the pupils, or at least does not detract from it.

Having determined this to his satisfaction, the teacher may want to go one step further. Since as a teacher he is concerned with developing appreciations as well as knowledge, it is of value to his students to be exposed to good pictures. As Dale has pointed out, "We develop good taste by tasting good things." Pictures that are good from an artistic standpoint not only can communicate more effectively, but also can help engender aesthetic experiences whose benefits may remain with students long after they have forgotten the occasions for which such pictures were used. Take another look at the pictures in this chapter and pick out those you think meet this requirement particularly well.

Good Contrast. Sometimes we say that a picture is "flat." This may mean several things, one of which is that the important parts do not stand out enough from the rest of the picture. In consequence, the picture as a whole lacks luster and vitality. With better lighting, exposure, and developing, the blacks will look blacker, the whites whiter, and the picture as a whole will be more interesting and effective. Notice the difference between the two pictures in Fig. 4.18. Both subject and camera position are identical. The only difference is in contrast.

It is also possible to have too much contrast; this produces a harsh effect. Therefore the good photographer or artist strives to get just the right amount. And as discriminating selectors, teachers should look for this important quality in the pictures they choose for classroom use.

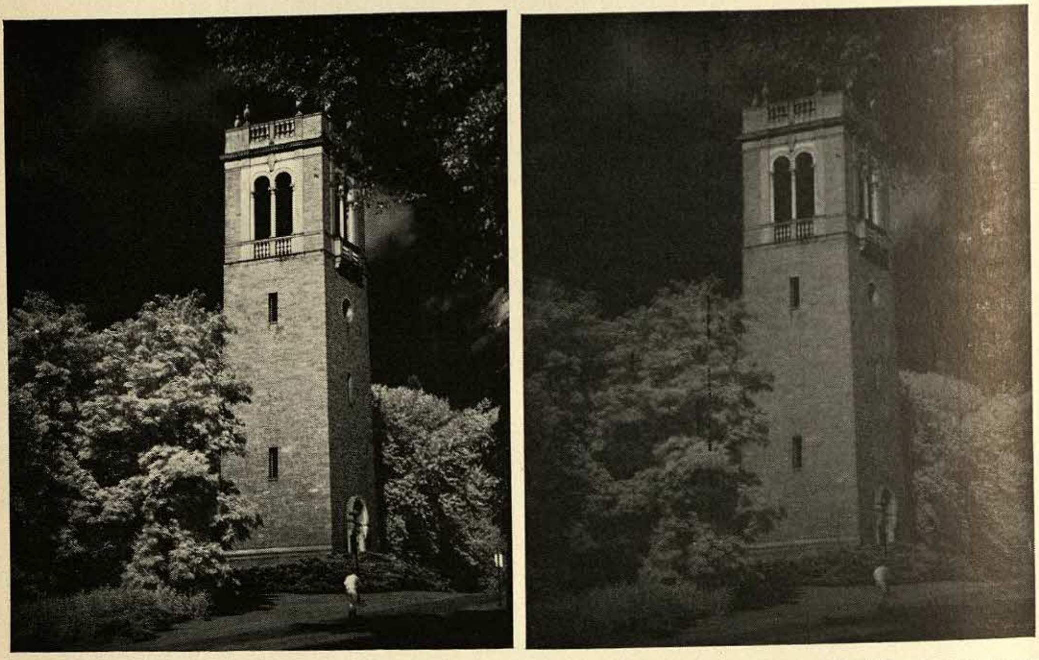

Fig. 4.18. The value of good contrast is shown in these two pictures. Besides being more attractive, what added communicative values does the more contrasty picture have?

Clarity and Sharpness. Clarity and sharpness constitute a related consideration in selecting pictures for school use. Although softness of focus is effective in portrait work and for the portrayal of certain moods, most educational subjects are better illustrated by pictures that are clear and sharp. The sharp picture with strong contrast provides better opportunity for accuracy in detail—a better representation of reality—and thus is preferable when information is the primary objective in using pictures.

PRESENTING AND CARING FOR PICTURES

Having selected pictures that are suitable for his teaching purposes and also of good quality artistically, the teacher is faced with the practical questions of (1) how to present them most effectively and (2) how to take care of them when they are not in use. Because having pictures in good condition and readily available when needed makes their effective use easier, we first consider mounting and storing flat pictures, and in the next section using them effectively.

MOUNTING PICTURES

The question of whether to mount pictures is a practical one for busy teachers. It boils down to something like this, as stated by an enthusiastic elementary teacher:

"I couldn't teach without pictures and have hundreds of them in my files. The big majority of them are not mounted because I simply haven't the time to mount them and besides they take up more filing space that way. But there are some special ones that I *do* mount because I wouldn't want them lost or torn. Still others I use once and throw away because I can easily find as good or better ones the next time the same topic comes up."

We classify flat pictures just as we do magazines, newspapers, and other materials of which we have a plentiful supply—in terms of relative usefulness. Outstanding or unique pictures which are just right and perhaps difficult to replace should be mounted to protect them from damage. Less valuable pictures and those of purely transitory or one-time use may be filed unmounted or be mounted fairly easily on temporary mounts.

Mounting pictures not only improves their appearance but also increases their effectiveness. An appropriate mounting helps focus the viewer's attention on the picture, and sets that picture apart from others around it. The right mounting of color pictures enhances the color effectiveness. Thus, for a variety of reasons, it is well to mount pictures that are used in teaching.

Some general considerations that should be observed regardless of the type of mounting include the following:

1. *Use generous margins.* Generous margins are not solely a matter of artistic taste but embody the direct application of the principles of attracting and holding attention. Any object tends to attract more attention when by itself than when crowded in among a number of other similar objects. Moreover, an appropriate mounting makes a good teaching picture more attractive just as an appropriate frame enhances a photographic portrait or a painting. In addition, the mounting protects the picture in handling and makes it easier to file.

Correct proportions for mounting pictures of various shapes are shown in Fig. 4.19. Note the width of the margins used. The width of the top and bottom margins is determined by the shape of the picture, as the illustration shows. Note also that the bottom margin is *always* wider than the top one.

2. *Use colors which direct attention to the picture and not to the mounting.* This means that as a rule it is best to select for the mounting a color that appears in the picture in a relatively minor degree. This repetition of color creates a pleasing harmony in the total effect given by the mounting and picture together. It is usually not wise to use a predominating color in the picture for the mounting because of the resulting loss of desirable contrast. A picture of a field of ripe grain will not appear to the best advantage on a yellow mounting, nor will a picture with a broad expanse of blue sky look well on a light blue mounting. In such cases the picture loses definition because, from a short distance away, it tends to merge with the mounting itself. When in doubt as to the precise color to use, the teacher will do well to experiment until he gets a satisfying effect.

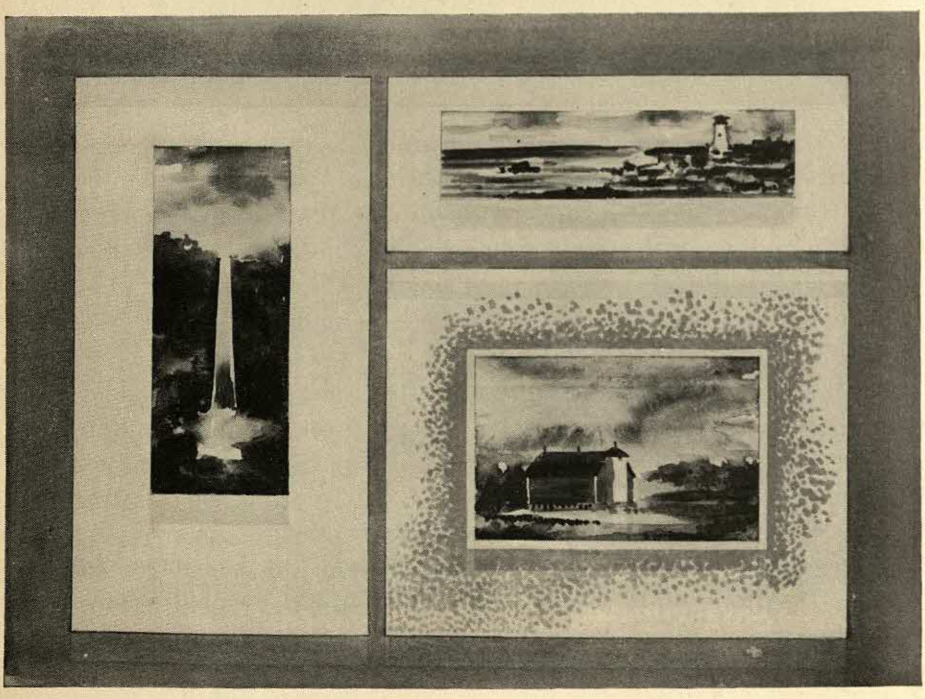

Fig. 4.19. The value of generous margins, of an accent border on some pictures, and of proper margin widths is illustrated here.

In general, neutral tones for mountings are more pleasing than primary or brilliant colors, although there are notable exceptions. Bright red or green mountings look well with Christmas pictures, orange mountings with Halloween subjects, and gay pastel mountings with Easter decorations. The idea here is to emphasize a gay and festive spirit; the purpose of these mountings may be primarily decorative, which is entirely appropriate in such cases. As a general rule, however, where informational purposes predominate, the above principles should apply.

Often a narrow border will help to set off the picture from the mounting. Sometimes an inked line around the picture is effective. A similar border effect is obtained by inserting, immediately behind the picture, a sheet of mounting paper slightly larger than the picture and of a different color from that used for the mounting itself. Since this sheet extends slightly beyond the edges of the picture, it provides a border in a contrasting color. White used for a border of this kind is often highly effective because it brings out the color in the picture.

3. *Use mounting materials appropriate to the picture subject.* Teachers frequently find colored drawing paper to be the most readily available material for picture mountings; it is also inexpensive. But once the teacher gets the feel and pleasure of attractive mountings, there is no reason why he should not give his ingenuity free play and experiment with a variety of textures, materials, and colors in obtaining desired effects. A shop teacher, for example, may find a metallic background ideal for a series of metal-working pictures; a background of old maps may be very effective for a series of historical illustrations; fabrics of various kinds or pieces of wallpaper make appropriate and interesting mounting materials for pictures on interior decoration. Dress and suit boxes and even corrugated cardboard make very effective mounts if carefully cut to a uniform size. The possibilities are virtually without limit except as to the time, interest, and ingenuity of the teacher himself. (See Source Lists, page 478, for mounting and display materials for flat pictures.)

Temporary Mountings

RUBBER CEMENT. One of the simplest methods of mounting is to coat the back of a picture with rubber cement and lay it on the mounting surface. Rubber cement comes in convenient tubes and jars, is not messy, and has the added virtue of being readily removable. Should some of the cement squeeze out around the edges when a picture is pressed down on the mounting surface, the excess can be rubbed off with the fingers. The cement does not dry completely for a long period of time nor does it tend to soak into the paper surface. This means that a picture can be peeled off of a mounting whenever desired. A more permanent mount is obtained by coating both the picture and the mounting and allowing the two surfaces to "set" for a minute or two before putting them together.

Rubber cement can also be applied along the edges of the back of the picture; it will hold very well if the picture is not on heavy stock which will tend to curl. Dabbing on liquid paste or glue at the corners is a well-known method of "pasting" pictures. This can also be done satisfactorily with rubber cement if the picture is on magazine or lighter-weight paper stock.

OTHER ADHESIVES. Various gummed tapes are of some value in mounting flat pictures. The best of these is a double-surface masking tape. Strips of this tape are placed on the back of a picture, which is then pressed on the mounting surface. This tape can also be used for displaying mounted pictures on bulletin boards and other surfaces.

A synthetic waxlike adhesive is likewise used for mounting, particularly for displaying mounted pictures on virtually any type of surface. Small bits of the wax are sufficient to hold the mounted picture in place for as long as desired.

PINS AND THUMBTACKS. A bulletin board display that is studded with shiny-headed thumbtacks is usually far from attractive. A much better effect is obtained by using straight pins, as many art teachers do; the pins cannot be noticed more than a few feet away. Pins are particularly useful when time does not permit the use of better methods. Other types of mounting devices are shown in Fig. 4.20.

Permanent Mountings. When a picture is to be used repeatedly or handled frequently by students, some type of permanent mounting is demanded. A fairly stiff backing material, such as Bristol board or heavy cardboard, is necessary to provide a firm backing and reduce wear.

FLOATING. In floating, the entire back of the picture is coated evenly with a layer of paste, glue, or liquid cement. The picture is then placed on the mounting and carefully smoothed down. Pictures so mounted should be put in a press or under a pile of books until they are dry in order to assure a good bond at every point and to minimize curling. Only enough adhesive should be used to coat the picture very lightly because any excess around the edges is difficult to remove without impairing the appearance.

A good way to eliminate warping or curling in this method of mounting is to cut a piece of paper the same size as the picture, coat this paper with the same adhesive as is used on the picture, and apply the paper to the *back* of the *mounting*. As both sides dry, the contraction or "pull" is equalized and the mounting stays flat.

DRY MOUNTING. Dry mounting requires a special tissue material that is affixed by means of a hot iron. A neat, professional-looking mounting job can be done with a little practice.

The dry-mount tissue can be obtained in rolls or sheets from photographic supply stores. Kraft board or some other type of cardboard is very satisfactory for the mounting. The other materials required are plain white paper, clear flat lacquer and thinner, and a sprayer like that used for insecticides or paint.

In using the dry-mounting process, a piece of the dry-mount tissue is trimmed to picture size and put on the back of the picture. The picture and the tissue backing are then placed on the mounting material and covered with a piece of plain white paper. An iron heated to about 300 degrees is applied firmly, the picture being literally ironed onto the mounting. The mounted picture is then sprayed with clear flat lacquer to protect it.

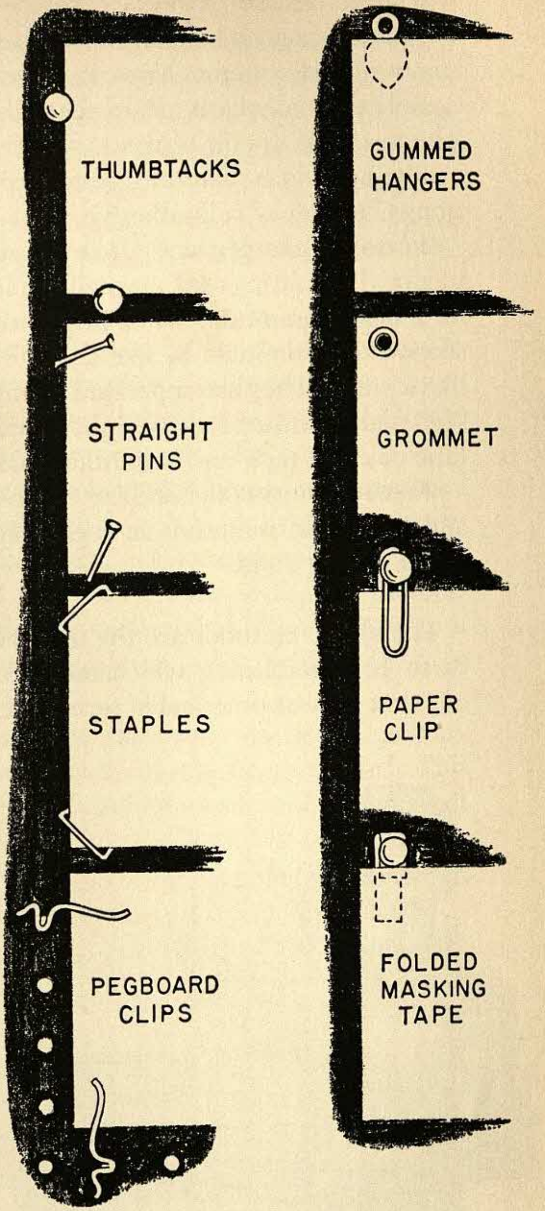

Fig. 4.20. Examples of fasteners for pictures.

LAMINATION. A commercial type of mounting known as lamination seals the picture in a clear, nonglossy plastic covering that permanently protects it from dirt, moisture, and tearing (Fig. 4.21). The plastic material is flexible, light in weight, and sufficiently strong to prevent damage from continuous handling.

The use of a plastic mounting makes feasible the circulation of sets of pictures from school to school within a system. The audiovisual department of the Los Angeles City Schools, for example, uses plastic mountings for such pictures. Not all pictures need a permanent mounting of this type, but it is well suited for those that are to be circulated or are irreplaceable.

The expense of laminating equipment restricted its use in the past to larger school systems. Now, however, equipment and plastics can be obtained at a cost which makes the process practical for small school systems. Also available are clear plastic sheets such as Sealamin and Clear-on, which can be applied by hand to protect pictures. Sealamin is applied with a hot iron; Clear-on is self-adhesive.

SECTIONAL MOUNTINGS. It is frequently advantageous to use a series of identical mountings for magazine-fold pictures or murals that are too large for a single mounting. When displayed, the series is a unit, for the individual sections are identical in size and coloration and when fitted together look like a panel. They are separated for filing and storage. In another method of sectional mounting light-weight sections are fastened together with masking tape or cloth tape and accordion-folded when not in use. Either method is a practical solution to handling the ever-increasing number of excellent two- and three-fold materials in such magazines as *Life, Look,* and the *Saturday Evening Post.*

The above methods are the ones most commonly used for mounting pictures. In determining which method to use, the teacher should select the one that is most practical in terms of time, effort, and utility. Pictures should be mounted if they are to have maximum effectiveness as teaching tools. A few well-selected and well-mounted pictures can provide rich sources of information in an attractive and interesting form.

FILING AND STORING PICTURES

Teachers who go to some trouble to find and use good pictures know that the storing and filing of pictures when not in use is important. The following suggestions from teachers may help you to avoid some of the difficulties and frustrations that result from inadequate storage space or a lack of a filing system.

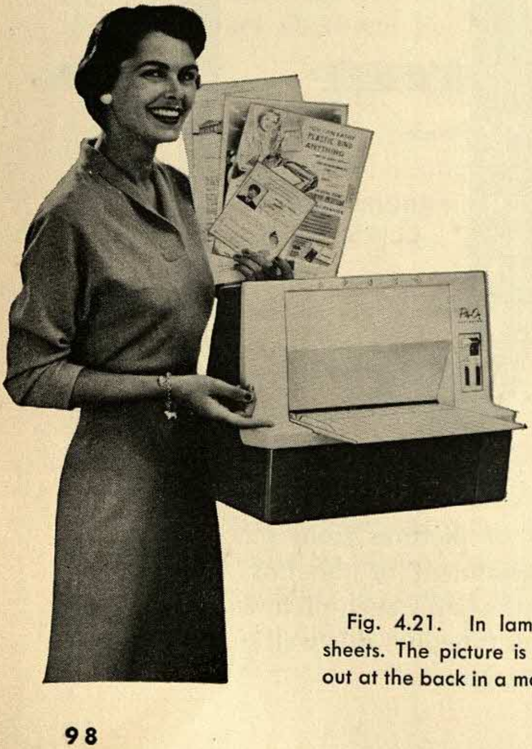

Fig. 4.21. In lamination, pictures are sealed between two plastic sheets. The picture is inserted in the front of the machine and it comes out at the back in a matter of seconds.

Standard Mounting Sizes. A compromise between desirable and practical sizes of mountings or mats is one way to lessen the storage and filing problem. Teachers frequently use two standard sizes of mountings—a small size which will go into a manila folder or a standard letter file, and a larger size which will fit into a drawer or box file. This plan means varying the width of the margins around pictures but is preferable to the alternative of not mounting pictures or of having them misplaced or damaged.

Organizing a Picture File. The simplest filing system involves grouping pictures according to the teaching units or topics in which they are used. When rather large numbers of pictures are involved, subheadings are helpful. For example, pictures on Greece may be subdivided as follows: Greece—Mountains, Greece—People, Greece—Farming, etc. Tabbed or colored separators should be used, the pictures in each section being listed in pencil on the separator. Other indexing systems include notebook lists, with identification of pictures by numbers or topics for quick location; similar lists in lesson plan folders; and a simple card file, with related groups of pictures listed on each card. The filing and indexing system should be as simple as possible but still flexible enough to accommodate additional pictures or sections.

Good picture collections are built up over the years. As better pictures are found, some of the older, less useful ones should be discarded. This keeps the files from getting filled up with seldom-used pictures, and it keeps the indexing system simple. A good filing and indexing system is like a good budget. It may be a bit difficult at first, but once it is functioning efficiently it works for you.

Storage. Modern classroom facilities include built-in drawers and cabinet space in which various instructional materials and supplies, including flat pictures, can be stored. Standard letter-size filing cabinets are suitable for small mounted pictures, but legal-size files are better because they accommodate material up to 11″ x 14″ in size.

Although many classrooms lack filing cases or other built-in storage facilities, ingenious teachers have devised various ways of storing and filing pictures (Fig. 4.22). Orange crates, heavy cardboard cartons, and boxes built to the desired size can serve the purpose satisfactorily and can be kept in out-of-the-way places when not in use.

Portfolios. Portfolios are an excellent means of protecting pictures while carrying them. Used by art teachers for many years, a portfolio is nothing more than two pieces of heavy cardboard or similar material hinged with a flexible tape on one of its long sides. Pictures or graphic materials are laid flat in the open portfolio, the cover is closed and tied, and it is ready to go. A portfolio can be made up in any size desired; one 34″ x 44″ accommodates most pictures and small charts and still is easy to carry. Portfolios can also be used for storage purposes.

GETTING THE MOST FROM PICTURES

From our summary of teacher suggestions over the past few years regarding the selection and use of flat pictures, several general principles emerge. One comment heard often in some form is, "I get the best results with pictures when I know exactly what I want to have 'seen' on each one." Another may be paraphrased this way: "When you get well enough acquainted with what each teaching tool can do and begin to use them as a 'team,' you're getting some place." A third comment says, in effect, "My picture files were getting so jammed that in desperation I threw out all but the very best ones. With the few that were left, I soon was getting the best results I'd ever had."

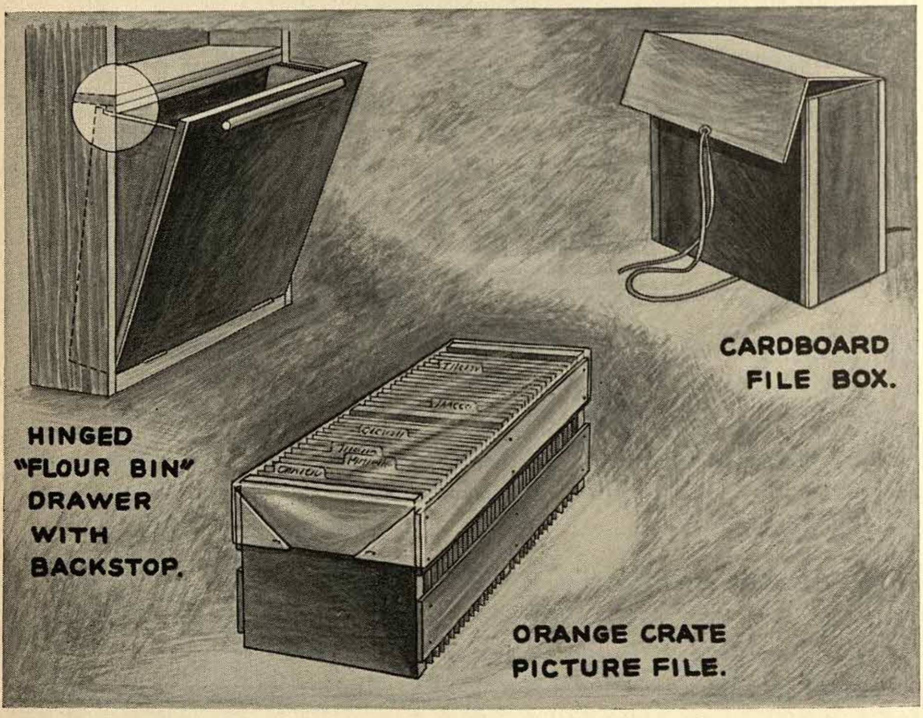
CARDBOARD FILE BOX.
HINGED "FLOUR BIN" DRAWER WITH BACKSTOP.
ORANGE CRATE PICTURE FILE.

Fig. 4.22. Here are a few suggestions for solving picture storage problems. Dimensions can be adjusted to suit your needs.

SOME RULES OF THUMB

Use pictures for specific purposes. Clear-cut purposes are important in using pictures as well as in selecting them. Having chosen a certain picture to illustrate a particular point, you naturally keep that point clearly in mind as you use the picture with a class. A good picture frequently contains much information, perhaps much more than you wish to discuss. Having specific purposes in mind, you can direct the pupils' attention to the most important items in the lesson.

If today's lesson on colonial life in New England is aimed at giving an understanding of the colonists' food, clothing, and shelter, you direct attention specifically to these items in the pictures you use. If the objective is a comparison of living conditions in the northern, middle, and southern colonies, groups of pictures providing these comparisons should be utilized. In one instance you may point out the comparisons yourself; in another you may let your pupils discover them. In either case you need to know clearly what you wish to accomplish. In other words, the objectives determine both which pictures you use and how you use them.

Use pictures along with other media. A knowledgeable teacher, discussing the cross-media approach to making geography come alive for her pupils, has this to say after describing the great variety of materials she uses: "When the teacher has skillfully exposed students to these many ways of seeing, hearing, and feeling, and 'orchestrates' their impressions through the cross-media approach, communication becomes more effective, and more information is grasped and retained. New ideas are no longer merely scribbled into notebooks, but are planted in minds and hearts as well. Teaching gains enough depth and breadth to meet the tremendous educational challenges presented by today's world."[7]

Effective use of pictures in teaching requires that they be treated as integral parts of the lesson. Generally speaking, if pictures are to be used at all, something definite must be done with them. A purely casual reference to a picture implies to the pupil that it is of minor importance. Brief or limited reference to a bulletin board display gives a similar impression. For pictures to be of real worth in a lesson, they must contribute to the pupils' understanding and be used in such a way as to indicate their importance.

Pick the best; omit the rest. A third principle in the effective utilization of pictures is that they be used sparingly. A few well-selected pictures usually accomplish far more than twice as many carelessly chosen pictures do. All too frequently the bulletin board is so filled with materials that nothing stands out. It is unwise to assume that if one picture is good, two will be twice as good. The result may be so many illustrations that pupils are confronted with a mass of interesting but unorganized visual impressions.

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[7] Grace Nelson Lacy, "Cross-Media Approach to Geography," *NEA Journal*, January, 1961, pp. 22–24.

The principle here simply involves focusing attention on key ideas. Once these ideas have been well established, additional illustrations may be valuable for enlarging on the initial concepts. A picture of a turret lathe may be excellent for familiarizing the shop student with its important parts and levers. The instructor will then wish to expand these initial concepts by means of a series of pictures showing the step-by-step process of setting up a job. As a good shop teacher he will focus his students' attention by showing one picture in the series at a time. Later he may put the entire series where the students can consult it.

WHAT WE KNOW—AND DON'T KNOW

In discussing learning by means of flat pictures, we encounter an interesting paradox. Probably no medium of visual communication is more familiar or more widely used than pictures. Nor are there serious questions about the teaching-learning effectiveness of pictures. Much solid research backs up the fact that a superior kind of communication and learning takes place through them. Yet we know relatively little about just how or why people learn from pictures as well as they do. There is much to be learned about what happens when one looks at a picture.

Perhaps it is sufficient for our purposes here that highly effective communication *does* take place through pictures. On the other hand, several good clues to the selection and use of pictures in teaching derive from what we do not know about the psychology of learning from pictures.

For example, uncertainty about exactly what concepts can best be taught pictorially in a particular unit leads to the common-sense practice of using several media simultaneously. Knowing further that marked individual differences are to be expected in ability to "read" pictures as well as verbal symbols (although we know less regarding the precise nature of these differences in picture-reading ability) leads us to avoid the obvious error of assuming that seeing a picture is enough to insure learning from it.

The need for directed viewing of pictures is supported by Buswell's early study of eye movements of children looking at art subjects. He made the following observations:

> Two general inferences in regard to teaching children may be drawn from study of eye movements. First, the teacher must expect that in studying a new picture the pattern of perception at first will resemble that of a general survey of the picture as a whole. Without some directional teaching, this general survey is likely to be so satisfying to the pupil that he will make no further attempt

to study the picture and will be satisfied to say that he has seen that picture. There is little evidence to show that any real taste for art follows this type of superficial looking at pictures.

A second inference to be drawn is that if the child's attention can be centered sufficiently on certain aspects of the picture to induce him to examine those parts in detail, there may result an interest in the picture which will become so compelling that the child will study that picture until he can call it really his own.[8]

There is enough here to suggest the need for directing attention to points of importance in the pictures we use and for ascertaining that they are understood. There is also the broader implication that people have to be taught to read pictures. There are habits and skills to be learned in viewing pictures just as there are in reading the printed page. And there are wide variations in individual ability to read pictures accurately.

Studies in visual perception indicate that the eye can be fooled rather easily by illusory arrangements of lines and objects. For example, you are familiar with the illusion created by parallel lines such as railroad tracks that apparently come together in the distance. Further, the viewing of an identical scene by a large number of people rarely fails to provide later a wide range of interpretations of what actually occurred. This is one reason why the credibility of eyewitness accounts is questioned so intensively in the courtroom. More than a few defendants have been the hapless victims of witnesses who hadn't "seen" what they thought they had.

What all this means to us as teachers is that we need to be aware of the limitations as well as the strengths of the picture medium, both in terms of what we may expect from it and in the care with which we use it.

WHERE TO PUT YOUR PICTURES TO WORK

Up Front. Some flat pictures are large enough to use with the class as a whole. Large study prints, art prints, simple illustrations, and line drawings can be used to advantage in this way. You can hold them up or use a chalk rail or an easel. Why are the latter better, as a rule, than holding the picture yourself?

In the Opaque Projector. Pictures that are too small to be seen well are useless for large groups unless an opaque projector is used. Even very small pictures can be "blown up" to good size on the screen (Fig. 4.23). Brilliance of the image has been increased to the point where a complete blackout is no longer necessary for good results with an opaque projector. Some control of exterior light is necessary, however, if the many benefits it can bring to the classroom are to be realized. The 10-inch opening takes most illustrations

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[8] Guy T. Buswell, "Learning to Look at Pictures," *Progressive Education*, October, 1936, p. 422. See also his *How People Look at Pictures*, Univ. of Chicago Press, Chicago, 1935, p. 198.

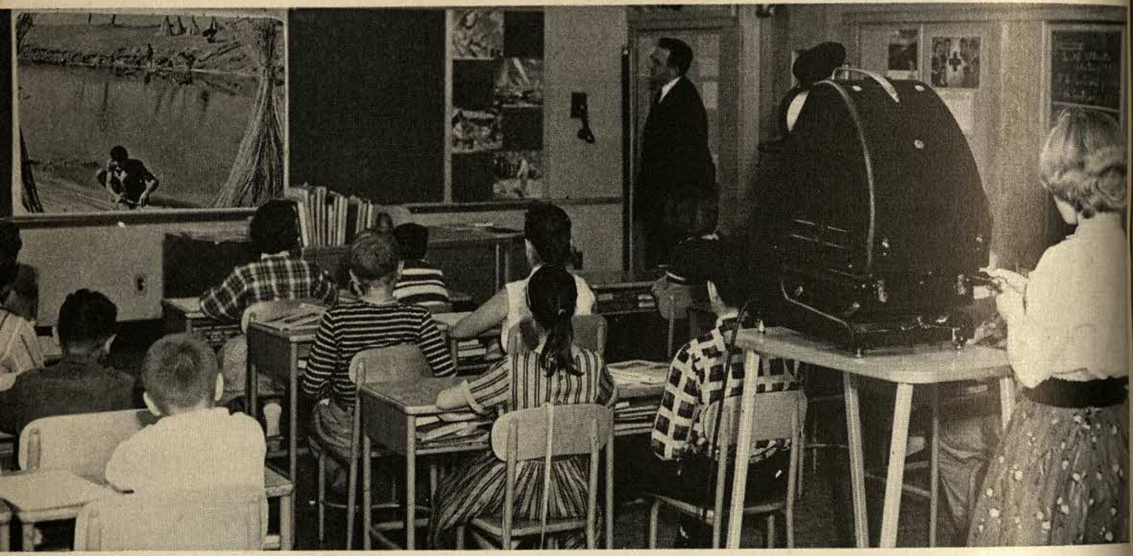


Fig. 4.23. Opaque projection makes small pictures visible to the whole class.

from magazines and books and they need not be cut out for projecting. It is a good idea to use a piece of Pyrex or other heat-resistant glass to keep unmounted pictures from curling and to flatten the surface of an open book in the projector so that all parts of the page are in focus.

When a series of pictures of similar size is to be shown, a convenient method is to mount each one on a piece of light cardboard like that used in Manila folders, fasten the pieces together with cellophane tape, and draw them through the projector. This provides a filmstrip arrangement of flat pictures which can be accordion-folded for easy storage when not in use. A picture story drawn by the children on long strips of paper about 10 inches wide can also be run through the projector. (Opaque projectors are discussed more fully in Chapter 12.)

In Study Displays. The suitability of flat pictures for study displays was discussed earlier in this chapter (page 76). Consequently here we merely emphasize that some of the best communication by pictures is achieved by study displays.

In Individual or Small-Group Work. The psychological value of flat pictures lies not only in their lifelike realism, but also in the possibility for individual study at the learner's own rate and interest level. Suppose, for example, that a series of pictures on life in India has been shown in the opaque projector and then arranged in a bulletin board display for an intermediate-grade social studies class. Once the class has viewed and discussed the pictures, further and more intensive study of these and other pictures by individual pupils may well be made one basis of committee reports and individual projects.

In this way, pictures come to have an integrated place in teaching and learning methods. They are recognized by pupils as sources of information along with books, films, slides, maps, field trips, and other media, each of which is a valuable member of the team of instructional materials.

SUMMARY

Flat pictures are so readily available that it is easy to underestimate their importance in teaching and learning. The picture medium as a whole has a certain universality and versatility that no other medium of communication shares. But, as is true of all media, there are both intrinsic and extrinsic limitations which must be considered in selecting and using pictures.

Care in selecting flat pictures is the first essential for effective results from their use in teaching. The starting point in selection is objectives which are clear and explicit. The pictures chosen must be valid and be directly pertinent to those objectives. They must be suited to the maturity level of the students. In addition, they should have good artistic quality. The better the quality, the better the picture is likely to communicate.

Some form of temporary or permanent mounting increases the effectiveness of flat pictures. Also important is a simple system of filing and storing so that the pictures will be protected and can readily be found when needed.

Effective techniques of using flat pictures with groups include showing them in front of the group if they are large enough, projecting them on an opaque projector if they are small, and incorporating them in study displays. Flat pictures also have great value for use with individuals and small group.

In general, it is better to use a few carefully selected, pertinent pictures instead of a larger number, and to combine them with other media to assure maximum learning. The effective use of flat pictures also requires directing the viewer's attention to specific points or impressions to be looked for. The instructor who recognizes the importance of the learner's background and prior experience and of the individual differences in ability to interpret pictures will secure the most satisfactory results from their use.

Suggested Activities

1. Ask each student to bring in several examples of good flat pictures in the respective subject-matter fields. Have the class evaluate a selection of these pictures in terms of the principles discussed in this chapter.

2. Have members of the class mount several flat pictures of different sizes, shapes, and colors. Discuss the effectiveness of the mounting used and suggest means of improvement.
3. Assign a committee to prepare a teaching display for the class on the subject "What Is a Good Picture?" Have the committee use the display in presenting the subject to the class.
4. Have a committee prepare an annotated and classified list of good sources of free or inexpensive flat picture materials for duplication and distribution to class members.
5. Ask each pupil to bring in a current issue of *Life, Look,* or a similar publication for use in a class discussion of the qualities of good photographs. Draw up a list of suggestions on how to take good pictures.

Bibliography

Bick, Harriet, and Meyer, Alberta L., "Making Pictures Talk to Children," *Portfolio on Audio-Visual Materials,* Association for Childhood Education International, Leaflet No. 4, 1951.

Brown, J. W., Lewis, R. B., and Harcleroad, F. F., *Audio-Visual Instruction,* McGraw-Hill, 1959, pp. 405–431.

Dale, Edgar, *Audio-Visual Methods in Teaching,* Dryden, rev. ed., 1954, pp. 243–258, 269–277.

East, Marjorie, *Display for Learning,* Dryden, 1952, pp. 54–87, 210–237.

Gibson, James J., "A Theory of Pictorial Perception," *Audio-Visual Communications Review,* Winter, 1954, pp. 3–23.

Hicks, Wilson, *Words and Pictures,* Harper, 1952.

Hoban, Charles F., Hoban, Charles F., Jr., and Zisman, Samuel B., *Visualizing the Curriculum,* Dryden, 1937, pp. 175–205.

Kinder, James, *Audio-Visual Materials and Techniques,* 2nd ed., American Book, 1959, pp. 50–75, 88–95, 432–450.

Koskey, Thomas A., *Baited Bulletin Boards,* Fearon, San Francisco, 1954.

McKown, Harry C., and Roberts, Alvin B., *Audio-Visual Aids to Instruction,* McGraw-Hill, 1959, pp. 136–157.

Meussig, Raymond H., "Using Projective Pictures," *Social Education,* May, 1958, pp. 250–252.

Miller, Bruce, *So You Want to Start a Picture File,* Bruce Miller, Riverside, California, 1954.

Ress, Etta Schneider, *The Use of Pictures to Enrich School Resources,* Creative Educational Society, Inc.

Sands, Lester B., *Audio-Visual Procedures in Teaching,* Ronald, 1956, pp. 234–254.

Sites, Raymond S., "Bringing the Nation's Art Treasures to the Classroom," *Audiovisual Instruction,* March, 1961, pp. 98–99.

Spaulding, Seth, "Communication Potential of Pictorial Illustrations," *Audio-Visual Communications Review,* Winter, 1956, pp. 31–46.

University of Illinois, *How Pictures and Graphs Aid Learning from Prints: A Review of the Research Evidence,* Technical Memorandum No. 4, Division of Communications, 1952.

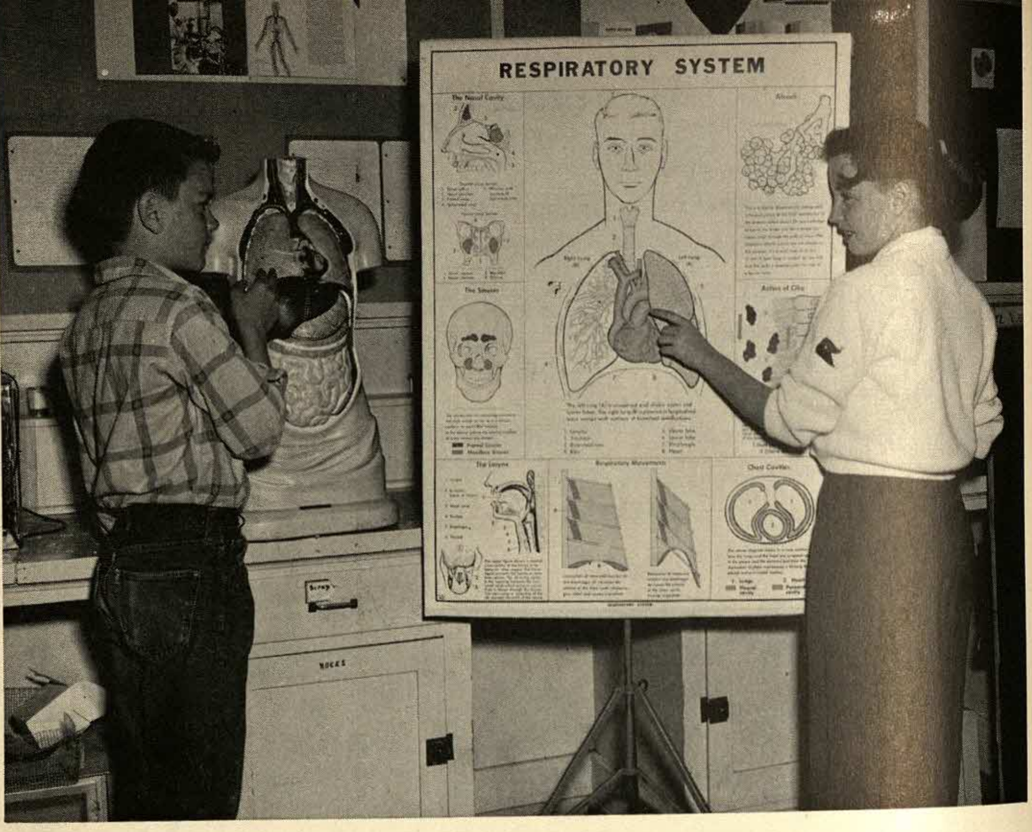
Williams, Catharine M., "Pictures with Purpose," *NEA Journal,* March, 1957, pp. 197–198.

AUDIOVISUAL MATERIALS

Passe Partout Framing (16mm. film) Sound, B&W, 10 min., Indiana University.

Teaching with Still Pictures (35mm. filmstrip), 53 frames, Color, Basic Skills Filmstrips.

S.C.E.R.T., West Bengal
Library
Calcutta
25/3, B. C. Road



CHAPTER 5

GRAPHICS

THE ROLE OF GRAPHIC MATERIALS in visual communication is both unique and significant. Historically, symbols—a basic part of graphics—have made possible the whole range of written languages used in the world today (Fig. 5.1). The science and theory of mathematics are also deeply indebted to symbols. Mathematics remained largely undeveloped until the adoption, less than 300 years age, of a symbol for zero. You will appreciate the significance of this symbol if you attempt to multiply or divide with Roman numerals such as MCMLIX and MIII. Rudolf Modley used this illustration in discussing symbols before a New York Art Directors Communications Conference:

"Yet, all that was needed to make these operations as simple as they are today was the invention and use of the symbol for 'zero'—which made positional numeration possible so that we can write 13, 103, 130, and 1003—all without need for more than 3 different numerals. The Indo-Arabic numerals, including 'zero,' have become so essential a part of our daily life that we cannot even think where we would be without them.

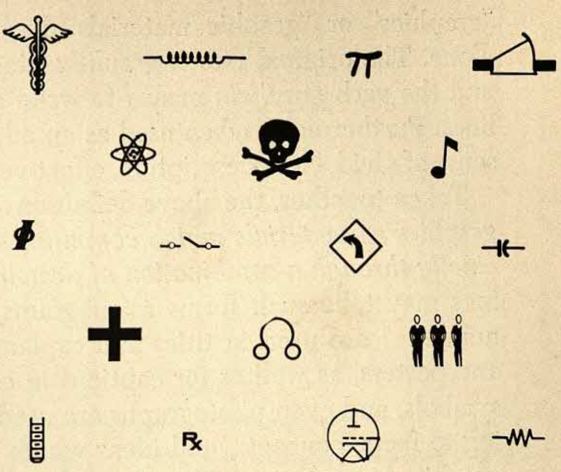


Fig. 5.1. Symbols play a key role in our daily lives. What other symbols do these suggest to you?

"Algebra, the cornerstone of modern mathematics, too, had to wait for letter symbols to free it from being tied to objects. Only then did the general theory of mathematics become possible."[1]

We noted earlier how simple line illustrations without words enabled illiterate Venezuelan farmers to understand an improved method of developing and selecting seed corn. That example of the potential of pictorial communication might properly have been used in the present chapter because drawing in some form is the most common single characteristic of the various graphic forms. Before going further, however, we shall first get a clearer idea of what we mean by the word "graphics." Then, as with the other media of instructional communication discussed in this book, we shall explore the unique potential of each type of graphics and the methods by which it can be used effectively in teaching.

WHAT GRAPHICS ARE

The distinction between graphics and other visual materials is less definite than that, for example, between 16mm. motion pictures and 35mm. filmstrips. One reason for this is that graphics represents a whole *group* of instructional visuals rather than a single type. It is comparable, in this sense, to such classification terms as *photographic materials* and *three-dimensional materials.*

Webster defines graphics as the art or science of drawing—especially mechanical drawing. As applied to visual materials, however, the term

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[1] Rudolf Modley, "The Challenge of Symbology," Fourth Annual Communications Conference of the Art Directors Club of New York. Reprints distributed by Department of Audio-Visual Instruction of NEA, 1960, p. 4.

"graphics" or "graphic materials" has a broader meaning than drawing alone. The original Greek *graphikos* included painting as well as drawing and the verb *graphein* means to write as well as to represent by means of lines. Furthermore, when used as an adjective, "graphic" carries with it the sense of vivid, clear description, effectively presented.

Taken together, the above definitions combine into a practical concept of graphics as *materials which communicate facts and ideas clearly and succinctly through a combination of drawings, words, and pictures.* The drawings may take such forms as diagrams, sketches, or graphs. Words (and numbers) are used in titles and explanations on graphs, charts, diagrams, and posters, as well as for captions in cartoons and comic strips. Sketches, symbols, and even photographs are used in graphic materials to give meaning to facts, concepts, and ideas which by their nature lend themselves to graphic presentation. Thus "graphics" includes a variety of visual forms, principal among which is drawing in some form.

The instructional values of graphic materials lie generally in their capacity to attract attention and to convey certain types of information in condensed, summarized form. A biology chart on cell division may outline the complete process of mitosis. A diagram of office organization may show quickly the channels of responsibility and departmental function. A graph of automobile production shows at a glance whether more or fewer cars are being produced this year than in preceding years.

CATEGORIES OF GRAPHIC MATERIALS

We have already mentioned symbols and illustrative drawings as two types of graphics. Since these are usually parts of other graphic forms, we shall discuss them in that context. Another type of graphics—maps and globes—has so many distinctive features and uses that these two forms are discussed in a separate chapter (Chapter 7). The remaining six principal types of graphics include graphs, diagrams, charts, posters, cartoons, and comics.

GRAPHS

Graphs may be defined as *visual representations of numerical data.* A table of figures may contain a wealth of valuable information, but a graph of the same data presents the gist of that information quickly and effectively. Furthermore, graphs reveal important relationships in the data—relationships such as trends and variations from normal. Finally, and of significance for the teacher, graphs are inherently more interesting than number tabulations, however well arranged the latter may be.

When Miss Gray wants to keep interest in library reading running high, one thing she may do is to post a progress graph showing the number of books read by each pupil in her class. Progress graphs can be purchased from school supply houses; these graphs have a number of bright red bars that are revealed by removing small sections of the overlaying paper. The pupils' names are inserted on the chart and one section of the overlay is removed for each completed project.

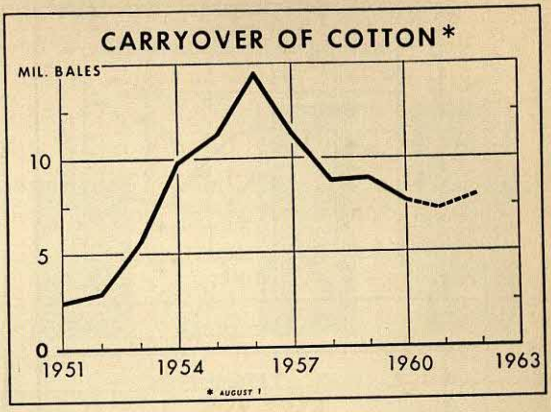


Fig. 5.2. Why is a line graph best suited to present information such as this?

The appeal of graphs is not limited to youngsters. Who is not familiar with the large thermometers used to register progress in fund-raising campaigns for the Community Chest or the new church to be built on the corner? The businessman relies on graphs to show the trends in his sales volume and he refers continually to them for information on business in general.

It is well to remember that the major purpose of graphing is to present comparative quantitative information quickly and simply. When a graph is intricate and difficult to read, it loses its chief advantage. Graphic concepts that are complex are more effectively presented, as a rule, in a series of simpler graphs than in one intricate composite. If a composite graph is desirable, it should follow a series of supporting graphs.

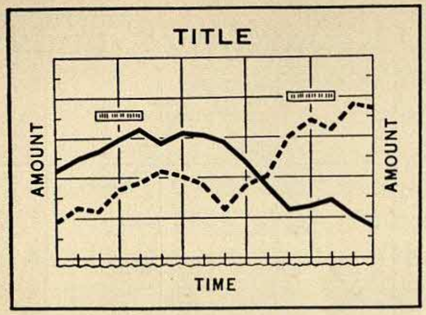
TYPES AND ADVANTAGES OF GRAPHS

There are many kinds of graphs. Among those most commonly used are the line, bar, circle or "pie," and the pictorial graph. Each type has certain advantages and applications.

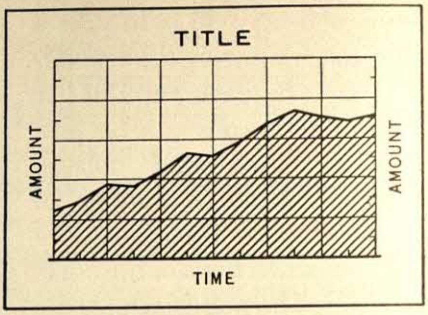
Line Graphs. The line graph is the most precise and potentially the most accurate of all graphs. It is therefore particularly useful in plotting trends or relationships between two series of data. A line graph should be used when a considerable number of data are to be plotted or when the data are continuous. The line graph shown in Fig. 5.2 was plotted from continuous data.

Numerous variations and combinations of the simple line graph are used, including shaded surface graphs of several types, and silhouette graphs. These and more familiar graph forms are shown in Fig. 5.3.

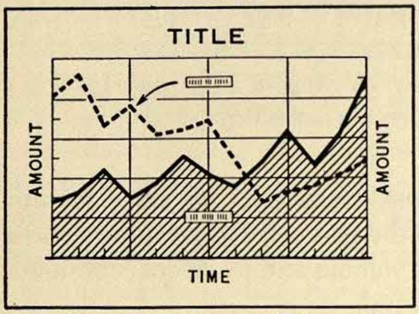
Bar Graphs. Bar graphs are probably the simplest of all graphs to read (Fig. 5.4). They are also easily constructed. Each of the several groups of



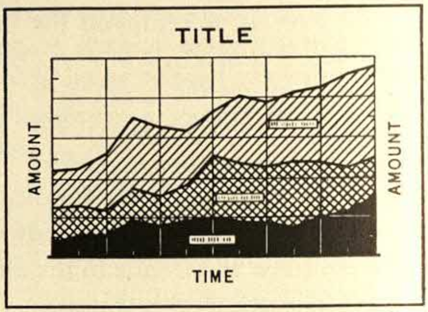
Line graph



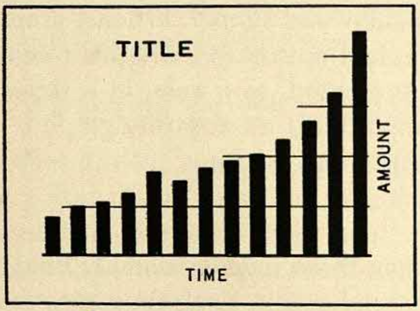
Single-surface graph



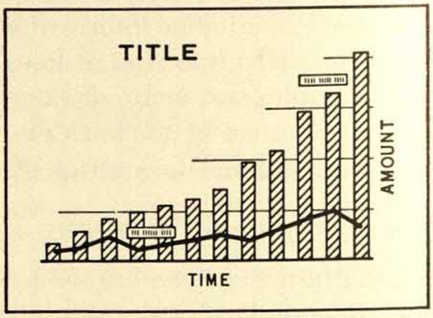
Combination surface and line graph



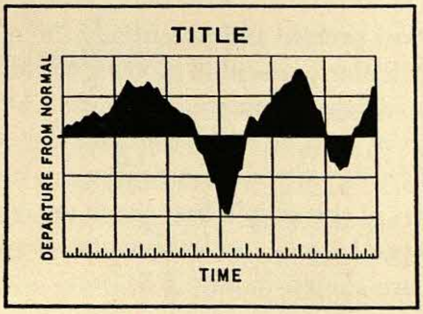
Multiple-surface or "Strata" graph



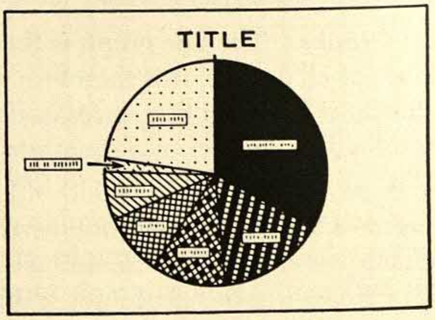
Column graph (single-series)



Combination column and line graph



Silhouette graph



Sector or "Pie" graph

Fig. 5.3. Can you identify the kind of information which could be best used on each of these types of graph?

data to be plotted is represented by either vertical or horizontal bars. The length of the bars expresses the amount or percentage of the data; all the bars are of the same width. The bar graph is employed to best advantage when the number of values to be compared is small—usually no more than six or eight. Occasionally a larger number of bars are used, but in such instances additional elements such as color or pictorial representations are needed to make the graph more readable and interesting.

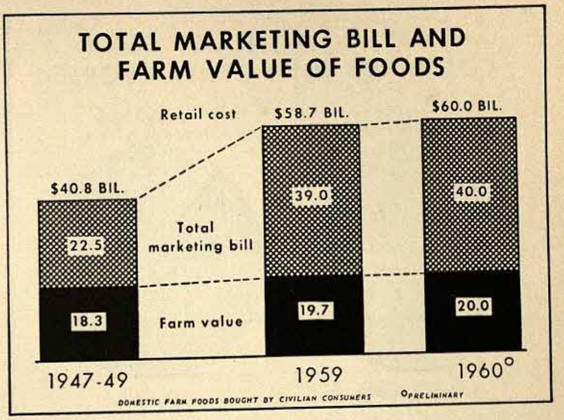


Fig. 5.4. Note the means used to make this bar graph readable both quickly and accurately.

Circle or Pie Graphs. When the intermediate-grade teacher introduces the subject of fractions, he may begin by cutting an apple into halves and quarters. He may apply a similar technique with the feltboard, fitting segments of a circle together to form the complete circle.

The circle or pie graph is a circle the sectors of which are used to represent component parts of a whole. Such information as the sources of the school dollar, the distribution of expenditures of a municipality, or the proportional sources of the world's petroleum supply can be well represented by pie graphs. A good example is shown in Fig. 5.5.

Two characteristics are common to all circle graphs. (1) They always present totals or whole amounts, and (2) their parts or segments are calculated in percentages or fractional parts of a whole. If a nation produces 10,000,000 tons of coal per year and 7,500,000 tons are bituminous, 2,000,000 anthracite, and 500,000 lignite, this information can be shown on a circle graph by shading 75 percent of the circle to represent bituminous production, 20 percent for anthracite, and the remaining 5 percent for lignite. When the point being made is the relationship of individual quantities to a whole, the pie graph is a natural and easily understood device to use. Research indicates that circle graphs are the most accurately read of all common graph forms when used to compare parts of a whole.[2]

Area and Solid Figure Graphs. Area graphs such as squares, circles, and irregular figures are occasionally used to compare two or three related totals. Frequently pictorial figures such as people, cattle, ships, or automobiles are used in this manner. Generally speaking, graphs that depend on comparable areas to present information are read less easily than line, bar, or circle graphs. This is because it is difficult to compare accurately two areas of different size without measuring them. Such graphs, therefore, sacrifice some of the definitive quality and readability which are characteristic of effective graphs.

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[2] Lewis V. Peterson and Wilbur Schramm, "How Accurately Are Different Kinds of Graphs Read?" *Audio-Visual Communications Review*, Summer, 1954, pp. 178–189.

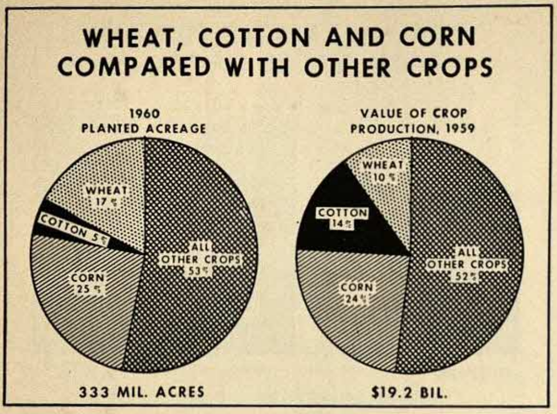

Fig. 5.5. Is the circle graph well suited for this type of information? Why or why not?

One value of the area graph, however, is the fact that it is used infrequently enough to be somewhat unusual; hence it catches the eye quickly. Another advantage is the fact that the area graph takes less space than other types. For example, you can fit into a fairly small space two squares or two circles of different sizes representing two comparable amounts. The same information on a bar or line graph would require a considerably larger area.

The solid figure graph (Fig. 5.6) contains spheres, cubes, or other figures that give a three-dimensional effect. Although more striking and interesting in appearance than the flat type of area graphs, some solid figure graphs have the similar disadvantage of being less easily read than simpler forms of graphs. In fact, many solid figure graphs require comparisons to be made in terms of cubic content, or volume—rather difficult to do with the same degree of accuracy as is possible with a circle or bar graph.

It is worthy of note that the addition of a third dimension does not of itself apparently make for less accurate reading of a graph. Peterson and Schramm[3] compared the relative accuracy with which 86 airmen could read eight types of graphs; each graph, unknown to the airmen, embodied the same five proportions totaling 100 percent. (See Fig. 5.6.) The findings indicate that the square column graph was read as accurately as the ordinary multiple bar graph. However, there was significantly less accuracy in reading the multiple cylinders than the multiple squares. Least accurately read of any of the eight graph forms were the multiple area column graphs.

It should be noted, as these researchers point out, that the above findings pertain specifically to graphs in which parts are compared to the whole. Further studies are needed to determine the relative effectiveness of various graph forms in quantitative comparisons which do not add up to 100 percent.

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[3] *Ibid.*, pp. 84–85.

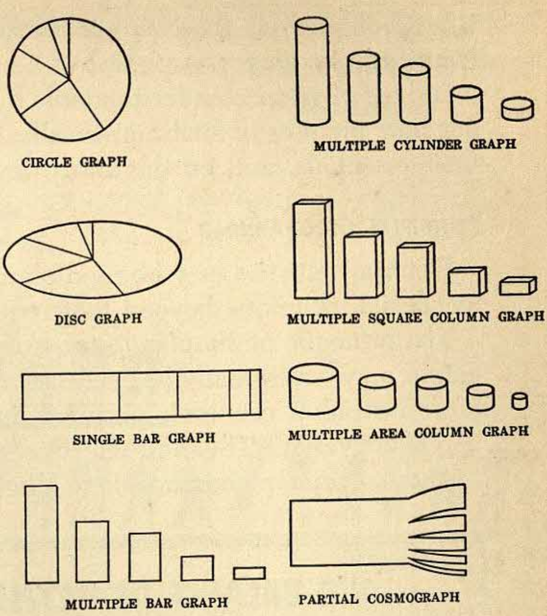

Fig. 5.6. How accurately are different kinds of graphs read? Which of these eight types do you think are most readable? Do your conclusions agree with the results of the research from which this illustration was taken?

A more recent study[4] tested the relative ease with which 250 high-school students and 100 Farm Short Course students comprehended nine different graph designs. These nine designs were made up into 25 graphs containing 11 graph variables. Each comparison involved two graphs that differed in only one variable. Among the findings were that both horizontal and vertical bar graphs were read more easily than line graphs; that both symbols and labels were better than crosshatched keys (legends) as far as readability was concerned; and that better results were obtained when quantities were written on each bar or element of the graph as in Fig. 5.7, than when grid lines alone were used. The investigators used fairly complex graphs for the study and did not explore the suitability of each graph variable for the necessary interpretive operation.

Pictorial Graphs. Much of the eye-catching appeal of three-dimensional figures is attained by the flat, simplified, picture-like figures used in pictorial graphs. Pictures of this type give the graphic form realism and interest. This type of graph, now used widely in magazines and newspapers, is as simple to read as a bar graph and it has the added advantage of using realistic figures to convey meaning. An example is shown in Fig. 5.8.

Pictorial statistics were first popularized in Vienna by Otto Neurath, an internationally known sociologist. Neurath constructed figures and symbols which he called "isotypes," variations of which are now used in most countries of the world. The immediate popularity of these "international pictographs" was due to the fact that they constituted a language equally intelligible to all nationalities. These graphic symbols are easily understood by students at all grade levels and at most levels of intelligence.

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[4] Hugh M. Culbertson and Richard D. Powers, "A Study of Graph Comprehension Difficulties," *Audio-Visual Communications Review*, Spring, 1959, pp. 97–110.

Symbols such as the Neurath isotypes are striking because they can be identified at a glance. A picture of a cow, a man, a woman, a child, a ship, or a sheaf of grain is understandable by virtually all peoples. Neurath found out how pictures of such universally familiar items could be simplified to their essentials, and on this basis developed his isotypes.

PRINCIPLES OF GRAPHING

Pictorial statistics may be used on any type of graph. Their use involves no special technique beyond that required for the basic graph form itself.

The principle of *simplicity*, for example, applies to all graphs. Intricate graphs may occasionally be necessary in plotting a variety of related factors for industrial or economic purposes, but such graphs sacrifice communication effectiveness. The most effective graphs highlight one or two ideas.

Another principle applicable to all graphs is that *comparisons or relationships must be shown*. Wheat production for a single year is not suitable for graphing unless it is compared with wheat production in other years or with the production of other grains in the same year. Graphing requires comparative data of some kind. Without comparisons or relationships to make them meaningful, there is little advantage in presenting statistics graphically.

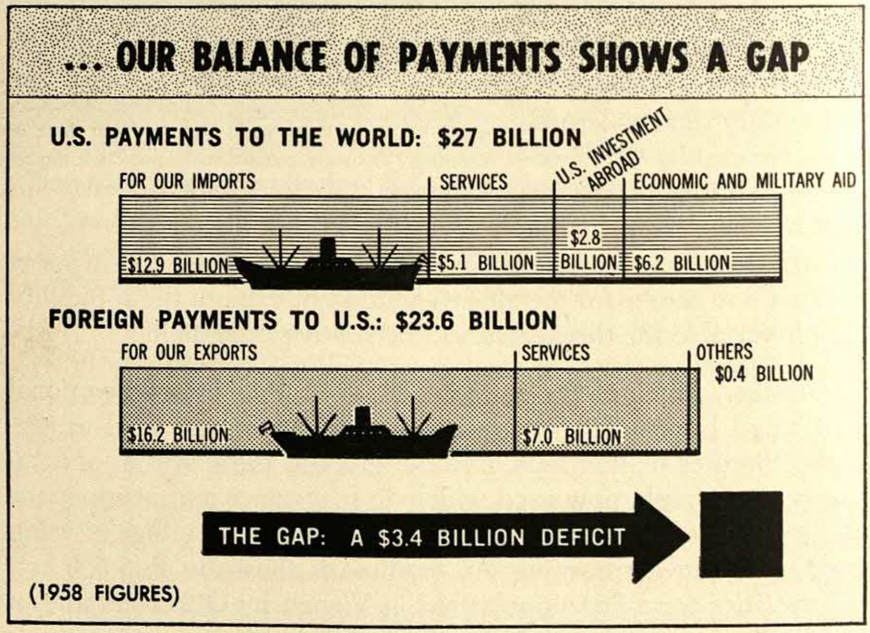

Fig. 5.7. Does this help explain our shipments of gold abroad? What is the explanation?

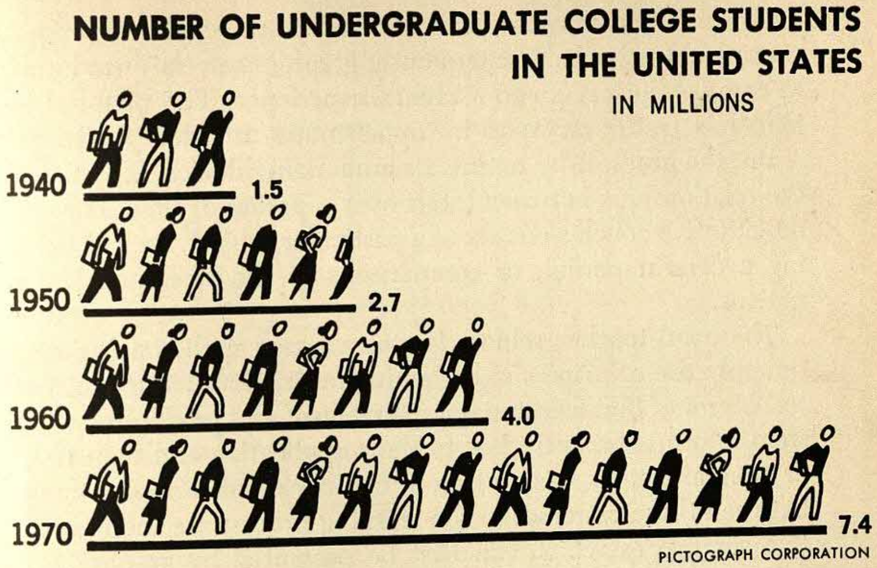

Fig. 5.8. In what way does pictorial treatment strengthen this graph?

A third principle of good graph construction is that *approximations rather than precise amounts should be shown.* A graph is intended to tell a story at a glance—to present comparisons, trends, and relationships. For these purposes minute details not only are unnecessary but tend to complicate the graph and to detract from its effectiveness.

In addition there are two principles which apply particularly to pictorial graphs. (1) The pictorial symbols should be self-explanatory. (2) Quantities are usually indicated by the number of symbols rather than by their size. Amounts indicated by several symbols of the same size are more easily comprehended than amounts indicated by the areas of similar but different-sized symbols. The reason is that accurate judgment of the area of an irregularly shaped object is difficult. Hence pictorial graphs normally use figures of one size, each figure representing a definite quantity; partial amounts are represented by partial figures. For example, each complete figure in Fig. 5.8 represents 500,000 college students.

USING GRAPHS IN TEACHING

Pictures convey meaning readily because they usually contain many elements already familiar to the student. Graphs, on the other hand, are principally symbolic and abstract in character; hence they are best used in the body and summary of a lesson after the student has acquired a background of information from other sources.

Children learn about graphs in intermediate-grade arithmetic—how to make them and how to read them. They see graphs in newspapers, magazines, and textbooks. Consequently graphic materials need not be regarded as completely foreign to a child's experience. The pictorial graph in particular is readily grasped by upper-grade or older pupils.

But the graph is by nature a summarizing device. It visualizes totals and the relationships between totals over a period of time. It expresses certain quantitative conclusions about a particular subject, such as immigration during a certain period, or comparisons of the steel production of several nations.

The good teacher seldom begins a lesson with conclusions. To do so is to apply the principles of deductive rather than inductive reasoning. Most teachers find that learning is more efficient and productive when it proceeds from information and ideas to their application and then to the principles or generalizations arising from a number of such applications. Somewhere between these extremes in the learning process are the necessary quantitative summaries which can best be presented by graphs.

During their study of the Scandinavian countries, for example, the pupils will profit from the use of graphs showing the trends in such factors as population, exports, and ocean shipping in each country over a period of years. Later, when comparing and summarizing their learning about the three countries, students will again find graphs a particularly helpful device. The experience acquired through various learning activities and materials such as books, pictures, films, and other media enables them to gain a kind of comprehension of the graph which would have been less possible at earlier stages of the learning experience.

DIAGRAMS

A diagram is a *condensed drawing consisting primarily of lines and symbols designed to show interrelationships, general outlines, or key features of a process, object, or area.*

Although most graphic forms are condensed visual summaries, the diagram is the most condensed of all. It relies heavily on symbols—a form of visual shorthand—to convey information. And because it is also stripped down to the barest essentials, the diagram tends to be highly abstract. This means that a background of knowledge and experience is usually necessary before diagrams can be read intelligently.

Have you ever tried to read a blueprint? If you have had technicians' training or experience in reading blueprints and hence know the many symbols used for electrical outlets, plumbing lines, kinds of material, and types

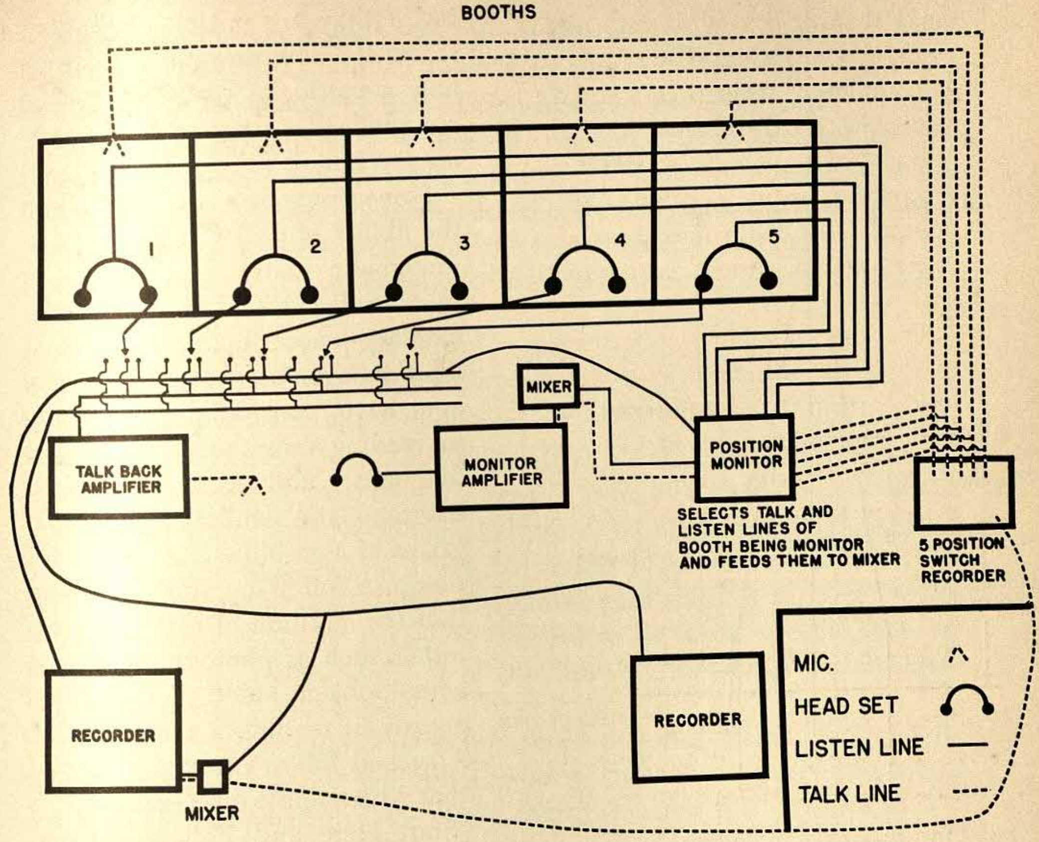

Fig. 5.9. This diagram describes a simple language laboratory. Can you analyze its arrangement clearly from the information provided?

of joints, for example, you can read the blueprint rather easily. Without this knowledge, it may be confusing and difficult to interpret. Yet this type of diagram is so important that modern construction and manufacturing would be impossible without it (Fig. 5.9).

Diagrams are also useful in our daily activities. A threading diagram is of considerable help in learning to operate a motion-picture projector. With diagrams and dress patterns to follow, many women become proficient in making their own clothes. Diagrams accompany many of the more complex toys youngsters receive at Christmas time. And thousands of boys (and fathers) use diagrams to assemble model airplanes, ships, and railroads.

Diagrams are important for learning many concepts in the social studies, sciences, mathematics, and language areas. Do you remember your own early efforts in diagraming sentences to identify the subject, predicate, verb, and modifiers? Teachers need to be aware that diagrams can *impede* learn-

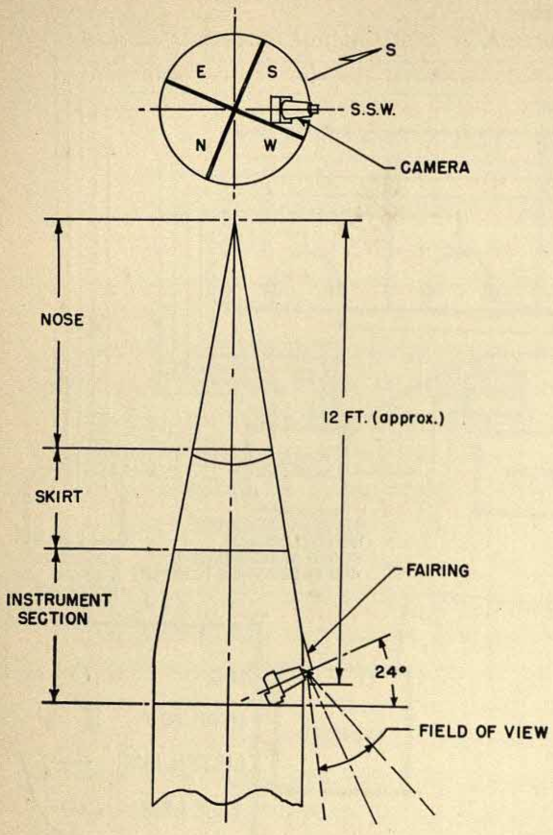

Fig. 5.10. Diagrams are typically abstract as shown in this one of a camera mounting in a nose cone.

ing if they are not clearly understood. It is often necessary to teach how a particular diagram is to be read before it can serve to *implement* learning (Fig. 5.10).

Some research has been done on the ability of children to read diagrammatic materials. A series of four studies by Malter with elementary-school pupils revealed that most children of elementary-school age have considerable difficulty in reading cross sections, process diagrams, and conventionalized diagrammatic symbols, such as diagrams of a gasoline engine and lift pump. A follow-up study revealed that the addition of clarifying materials such as photographs of the actual object aided the children greatly in reading a cross section. A second follow-up study showed that when simple directions such as "Start Here and Follow Arrows" were added to a process diagram of a flour mill, the children were materially helped in interpreting the diagram correctly, although there was evidence of a need for still further improvement in it.[5]

Malter's studies support the principle that *diagrams and similar materials of an abstract character require careful foundation work before they can be used efficiently with a class of pupils*. It follows that diagrammatic materials usually lend themselves better to summary and review than to introductory use in a lesson. As the teacher realizes, the interpretation of even such relatively concrete media as pictures depends heavily on the experience which the child can bring *to* a picture. A diagram of the steps in flour processing will have much additional meaning *after* the pupil has had an opportunity of studying how flour is made and perhaps going through a flour mill.

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[5] Morton S. Malter, "Children's Ability to Read Diagrammatic Materials," *Elementary School Journal*, October, 1948, pp. 98–102.

A second principle is that *other appropriate audiovisual materials should be used with diagrams to make them more understandable.* Such materials as pictures, slides, filmstrips, and motion-picture films all have as their basic function the clarification of significant concepts. While each audiovisual medium has certain unique advantages in a specific instance, the coordinated use of several types of instructional materials yields the best results in most teaching situations. This principle is particularly pertinent in the use of diagrammatic materials because of their relatively high level of abstraction.

CHARTS

The term "charts" has a number of meanings. To the navigator a chart is a particular kind of map. To the businessman it may be a graph or a tabular treatment of sales data. To the engineer it may be a diagram. To the teacher a chart is more likely to be a graphic means of presenting a variety of related materials on large sheets of paper or cardboard at the front of the room. For our purposes, it will be helpful to be more specific, because charts are a distinctive medium of visualization that have certain characteristics of their own.

Charts are *combinations of graphic and pictorial media designed for visualizing relationships between key facts and ideas in an orderly and logical way.* The particular role of the chart is to show relationships such as the sequence of steps in cell division, the parts of a flower, a time line of historical events, the organization of the United Nations, or the by-products of crude petroleum.

TYPES OF CHARTS

There are many types of charts; among them are classification charts, genealogy charts, flow charts, relationship charts, tabulation charts, and chronology charts[6] (Fig. 5.11). The charts most commonly used in teaching are genealogy or tree charts, flow charts, and chronology or tabular charts.

Tree Chart. As its name suggests, the *tree* chart is developed from a base composed of several "roots" which lead into a single trunk. The branches, in turn, represent developments and relationships. A good example is a genealogy chart in which two individuals are the roots from which a family "tree" grows. The tree chart is useful in showing developments resulting from a combination of major factors. For example, such a chart is suitable

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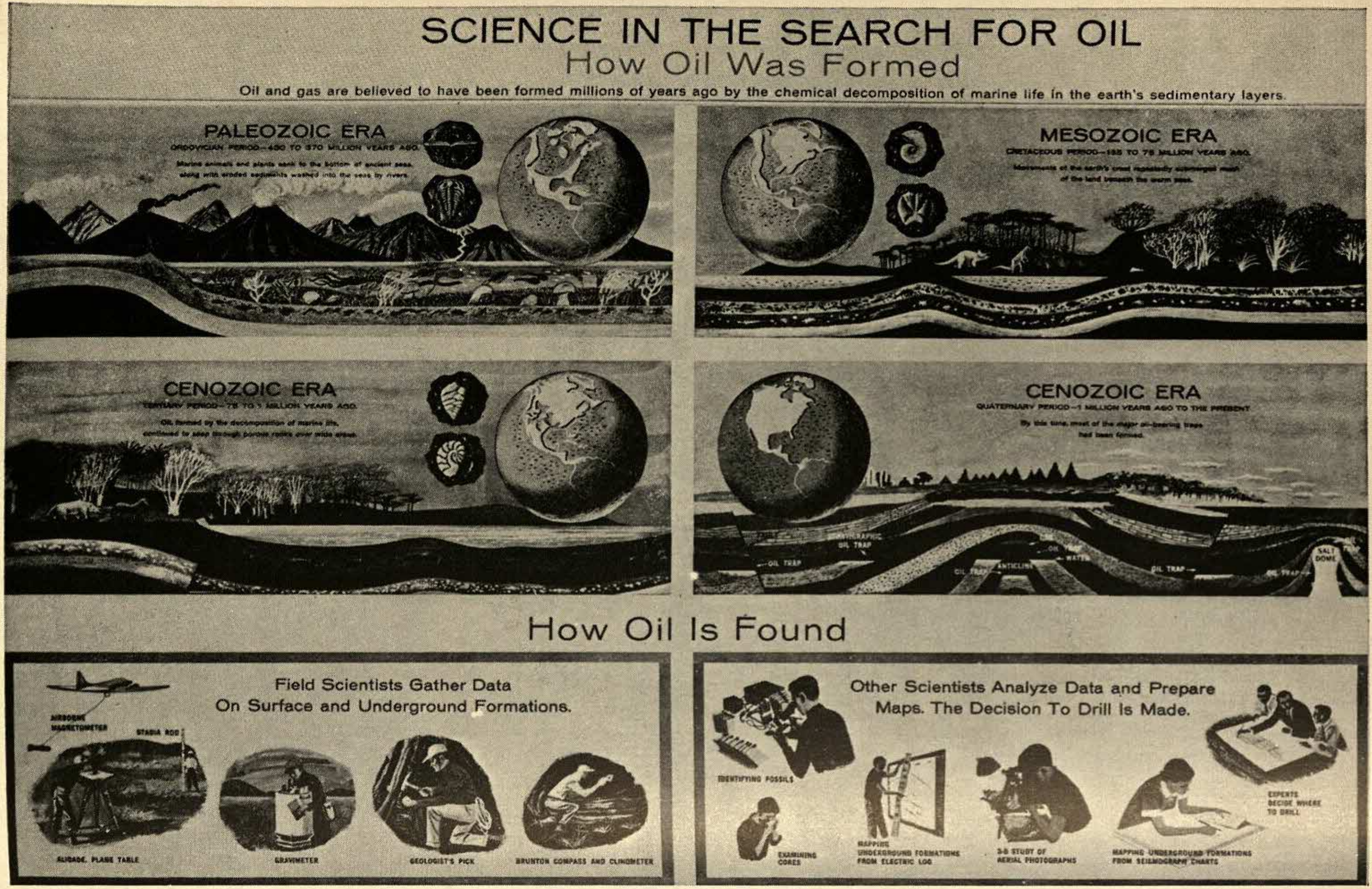
[6] See Willard C. Brinton, *Graphic Presentation*, Brinton Associates, New York, 1939, chaps. 3–8, 31, for descriptions and uses of the types of charts listed.



SCIENCE IN THE SEARCH FOR OIL

How Oil Was Formed

Oil and gas are believed to have been formed millions of years ago by the chemical decomposition of marine life in the earth's sedimentary layers.

PALEOZOIC ERA

ORDOVICIAN PERIOD—450 TO 370 MILLION YEARS AGO.

Marine animals and plants sank to the bottom of ancient seas along with eroded sediments washed into the seas by rivers.

MESOZOIC ERA

CRETACEOUS PERIOD—135 TO 75 MILLION YEARS AGO.

Movements of the earth's crust repeatedly submerged much of the land beneath the warm seas.

CENOZOIC ERA

TERTIARY PERIOD—75 TO 1 MILLION YEARS AGO.

Oil, formed by the decomposition of marine life, continued to seep through porous rocks over wide areas.

CENOZOIC ERA

QUATERNARY PERIOD—1 MILLION YEARS AGO TO THE PRESENT

By this time, most of the major oil-bearing traps had been formed.

How Oil Is Found

Field Scientists Gather Data
On Surface and Underground Formations.

Other Scientists Analyze Data and Prepare
Maps. The Decision To Drill Is Made.

IDENTIFYING FOSSILS
EXAMINING CORES
MAPPING UNDERGROUND FORMATIONS FROM ELECTRIC LOG
3-D STUDY OF AERIAL PHOTOGRAPHS
MAPPING UNDERGROUND FORMATIONS FROM SEISMOGRAPH CHARTS
EXPERTS DECIDE WHERE TO DRILL

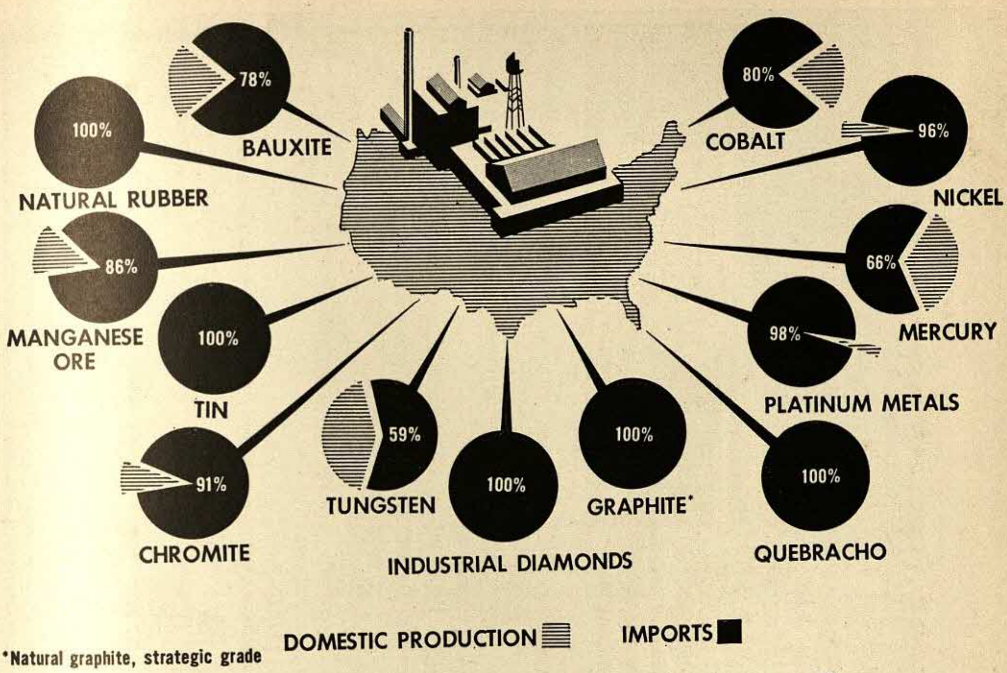


Fig. 5.12. Is the meaning of this stream chart clear? What elements are used?

for showing the many by-products obtainable from coal. It is likewise effective in showing how iron ore, limestone, coke, and various chemicals may be combined to produce a variety of types of steel.

Sometimes a reverse form of the tree chart is useful in showing how a great variety of elements are combined to form one important product. This type of chart is known as a *stream* chart. It can be used to illustrate an industrial nation's dependence on other countries for strategic materials (see Fig. 5.12).

Flow Chart. The organization of a student council or a unit of government, the development of a manufacturing process, or the steps whereby a bill becomes a law can be shown to advantage in a *flow* or organization chart (Fig. 5.13). This chart is well suited to showing functional relationships and is used widely in industry and government for that purpose.

Tabular Chart. Sequence relationships such as those in a historical time line or a timetable can be shown on a *tabular* chart. One of the unique values of the tabular chart is its ability to show time relationships. Variations of this form of chart include tables of information such as arguments for

◀ Fig. 5.11. Pictorial section from one in a series of charts on the origin and search for oil. How would you classify this chart as to type? How would you evaluate it? How would you use it?

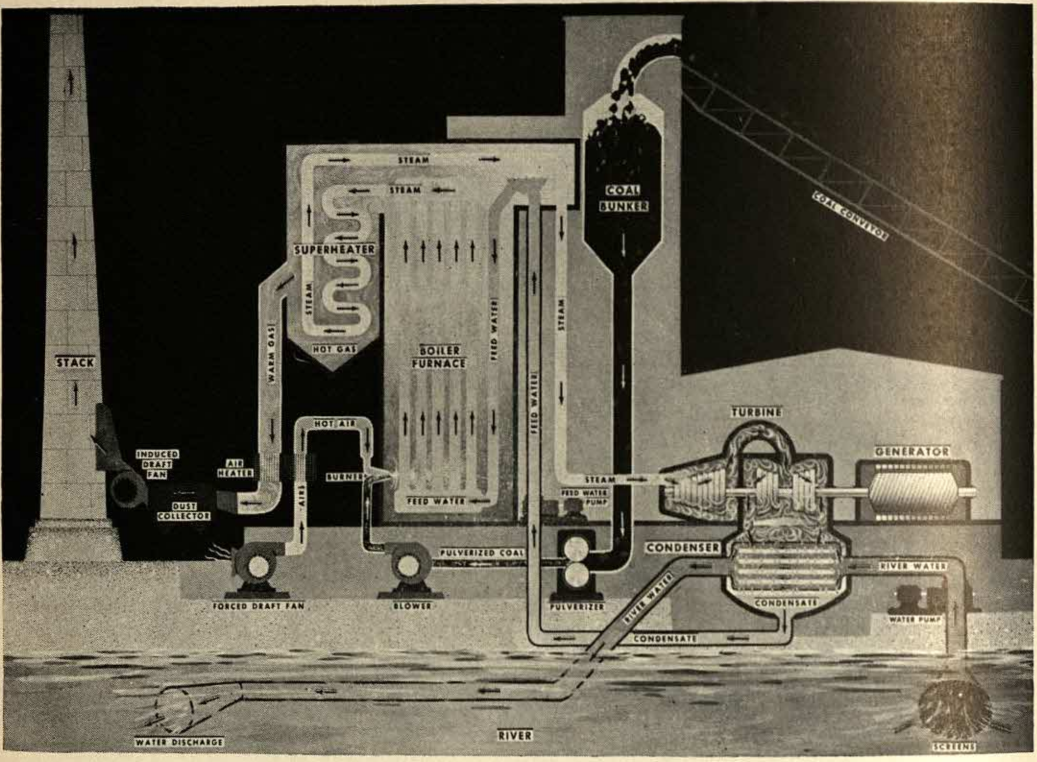


Fig. 5.13. Diagram and chart forms are sometimes combined as in this flow chart of a steam turbine generator.

and against a bond issue, nations participating in the United Nations, etc. (Fig. 5.14).

TEACHER- AND PUPIL-MADE CHARTS

Any of the types of charts described above are available from commercial sources. (See Source Lists, page 486.) But any of them can also be made by teachers or pupils. Some elementary teachers in Texas suggest the following possibilities which are named according to teaching function rather than type of chart:

1. *Experience charts:*
   A trip to the library, bakery, museum, etc., will be long remembered if some of the salient points are put down on charts.
2. *Achievement charts:*
   Charts setting down principles of spelling, arithmetic, or science that have been conquered by the class.
3. *Charts recording plans and class rules:*

GEOGRAPHY OF STEEL – 35 STATES MAKE FINISHED STEEL MILL PRODUCTS

HOT ROLLED PRODUCTS	Ala.	Ariz.	Ark.	Calif.	Colo.	Conn.	Del.	Fla.	Ga.	Hawaii	Ill.	Ind.	Iowa	Ky.	La.	Md.	Mass.	Mich.	Minn.	Miss.	Mo.	N. J.	N. Y.	Ohio	Okla.	Ore.	Pa.	R. I.	Tenn.	Texas	Utah	Va.	Wash.	W. Va.	Wisc.	No. of States
Structural Shapes	X			X	X				X		X	X									X		X	X		X	X			X	X		X	X		15
Piling											X	X											X				X									4
Plates	X			X	X		X				X	X		X		X							X	X			X			X	X		X			14
Sheets	X			X							X	X		X		X		X					X	X			X				X					11
Strip	X			X	X				X		X	X							X			X	X	X			X	X	X							13
Coils for Tin Plate	X			X							X	X				X								X			X				X			X		9
Bars, Reinforcing	X	X		X	X			X	X		X	X				X	X			X	X		X	X	X	X	X		X	X		X	X	X		22
Other Bars & Lt. Shapes	X	X		X	X	X		X	X	X	X	X		X		X		X	X	X	X	X	X	X		X	X		X	X	X	X	X	X	X	28
Wire Rods	X			X	X				X		X	X				X	X		X		X	X	X	X			X	X		X						16
Blanks, Tube Rounds, etc.					X						X	X											X	X			X									6
Blooms & Billets †				X	X						X	X		X									X	X		X	X									9
Rails	X				X							X											X				X							X		6
Splice Bars, etc.	X			X	X							X											X				X					X	X			8
Wheels & Axles												X															X									2
Skelp	X			X							X	X				X								X			X			X				X		9
All Other	X				X						X							X									X			X						6
OTHER FINISHED PRODUCTS (Made from hot rolled items)																																				
Bars (cold finished)				X		X					X	X				X	X	X				X	X	X			X						X		X	13
Pipe and Tubing	X		X	X	X	X	X		X		X	X	X	X	X	X		X	X			X	X	X			X			X	X			X	X	23
Plain Wire	X			X	X	X		X	X		X	X				X	X	X	X		X	X	X	X			X	X		X					X	20
Wire Products	X			X	X	X		X	X		X	X				X	X		X		X	X	X	X			X			X					X	18
Cold Rolled Sheets	X			X							X	X		X		X		X					X	X			X							X		11
Gal. & Long Terne Sheets	X			X							X	X		X		X								X			X							X		9
Cold Rolled Strip				X		X					X	X				X	X	X				X	X	X			X	X						X		13
Galvanized Strip									X		X											X	X	X			X									6
Tin Plate	X			X							X	X				X								X			X							X		8
Track Accessories	X			X	X						X	X									X	X	X	X			X					X	X			12
Products Made in State	19	2	1	20	15	6	2	4	9	1	23	24	1	7	1	15	6	8	6	2	7	10	20	21	1	4	26	4	3	10	6	4	7	11	5	

Fig. 5.14. In terms of the definitions given, how would you classify this chart on steel fabrication?

A field trip plan can be outlined on a chart to give special emphasis in advance to some of the important sights that will be seen.

4. *Instructional charts of wide variety:*
Number charts help bridge this critical step, the gradual realization of numbers as abstract ideas.

Phonetic charts are enormously helpful in establishing familiarity with common syllables and words and introducing the link between writing and speech.

Work charts list series of problems or questions to be answered. They also help develop reading skill and speed.[7]

HOW TO MAKE CHARTS

Teachers develop their own techniques as they gain experience in preparing charts and other graphic forms. The following principles and suggestions came from a number of teachers and graphic artists over a period of years:

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[7] Leona Doss, Ima Sorden, and M. K. Hage, Jr., "Classroom Charts Add the Crowning Touch," *Texas Outlook,* December, 1959, pp. 18–21.

1. Lay out a plan on a small sheet of paper. Make clear to the pupils that planning lies behind any worthwhile work. This is also a good opportunity to introduce simple principles of design to them.
2. Keep the chart simple. Remember that a good chart or diagram presents *one* principal idea or comparison. When it becomes intricate or complicated, it loses effectiveness.
3. Choose a terse, simple title; allow the pupils to help. Few of them understand the virtue of economy in words. Use bold but simple letters. Fancy lettering is seldom effective.
4. Make the chart large enough to be seen *easily* from anywhere in the room. Some teachers use a heavy black or colored line border to set off the chart. Colored tape or construction paper can also be used for this purpose.
5. Make it attractive. Plan for contrast, color, and plenty of space. Employ pictures, graphs, or other illustrations as suitable, occasionally using colored construction paper for background outlines and for emphasizing important sections.
6. Avoid crowding or using too many illustrations or other elements. When you use color, keep the colors harmonious. Don't overdo colors or the purpose of the chart may be missed.
7. When your plan is complete, sketch in guide lines and lettering lightly in pencil on the large chart. An opaque projector or grid lines are helpful in transferring your small sketch to the larger surface. Complete the chart.

MATERIALS FOR MAKING CHARTS

The following list indicates the various kinds of material and supplies that are good for making charts:

1. *Paper:* Butcher or other heavy wrapping paper; also newsprint. Colored construction papers are fine for color accents, outlines, and silhouettes.
2. *Backing:* Bristol board, poster board, tag board, and similar materials are available in various grades; the price depends on the grade. For large charts (over 30″ x 40″) bracing is necessary; a light-surfaced building board is good for backing. Heavy corrugated cardboard from mattress cartons is another possibility.
3. *Adhesives:* Rubber cement and glue are always good. For some work, the newer colorless and stainless cements—e.g., model airplane cement—are particularly useful.

4. *Letters:* Lettering can be the most time-consuming part of chart preparation. Stenso and other inexpensive lettering guides or gummed letters are available in many sizes and types at low cost.
5. *Tapes and Symbols:* Black or colored tapes are recommended for bars and wide lines. Gummed paper tape costs little, as do also gummed symbols such as arrows, circles, stars, etc.
6. *Pens*: Felt pens are handy and easy to use. Speedball pens, Payzant lettering pens (for extended lines), and India or other drawing inks are standard. Don't overlook heavy marking crayons and China marking pencils, particularly for temporary work.

POSTERS

Posters in primitive form have existed almost since the invention of movable-type printing in the fifteenth century. The first posters consisted almost entirely of text and carried notices of royal proclamations, tax assessments, fairs, markets, and newly printed books. Some of them had wood-cut illustrations. But it remained for lithography, which was developed in the mid-nineteenth century and made possible cheap and brilliant color reproduction, to bring the modern concept of posters into being.

The modern poster was born in 1867 in Paris, when Jules Chéret, the first of the great modern poster artists, was commissioned by Sarah Bernhardt to prepare a poster announcing her appearance in the play, *La Biche au Bois.* His use of color, design, and bold lettering was superb; it started a new trend in poster making.

As the poster idea caught on, many fine artists experimented with it in Europe and the United States. The best of these posters combined simplicity and visual force with emotional impact or wit; many became famous, like James Montgomery Flagg's recruiting poster shown in Fig. 5.15. During World Wars I and II, the major powers used large-scale poster campaigns to recruit armed forces, sell war bonds, maintain morale, and boost the war effort generally. United States Treasury officials regarded posters as highly significant in the success of the war loan drives during both world wars. In the meantime, the advertising industry and particularly the transportation companies adopted posters on a massive scale.

This is the background of the poster that today has a unique and important function among the visual communication media. Its role is very quickly to implant in the viewer's mind or to make him recall a single important idea—"Care,""Support Your Community Chest," "Fly BOAC," "Radio Free Europe," "Stand Tall," etc. Hence the poster must have strong eye appeal if it is to attract attention and have enough holding power to put its mes-

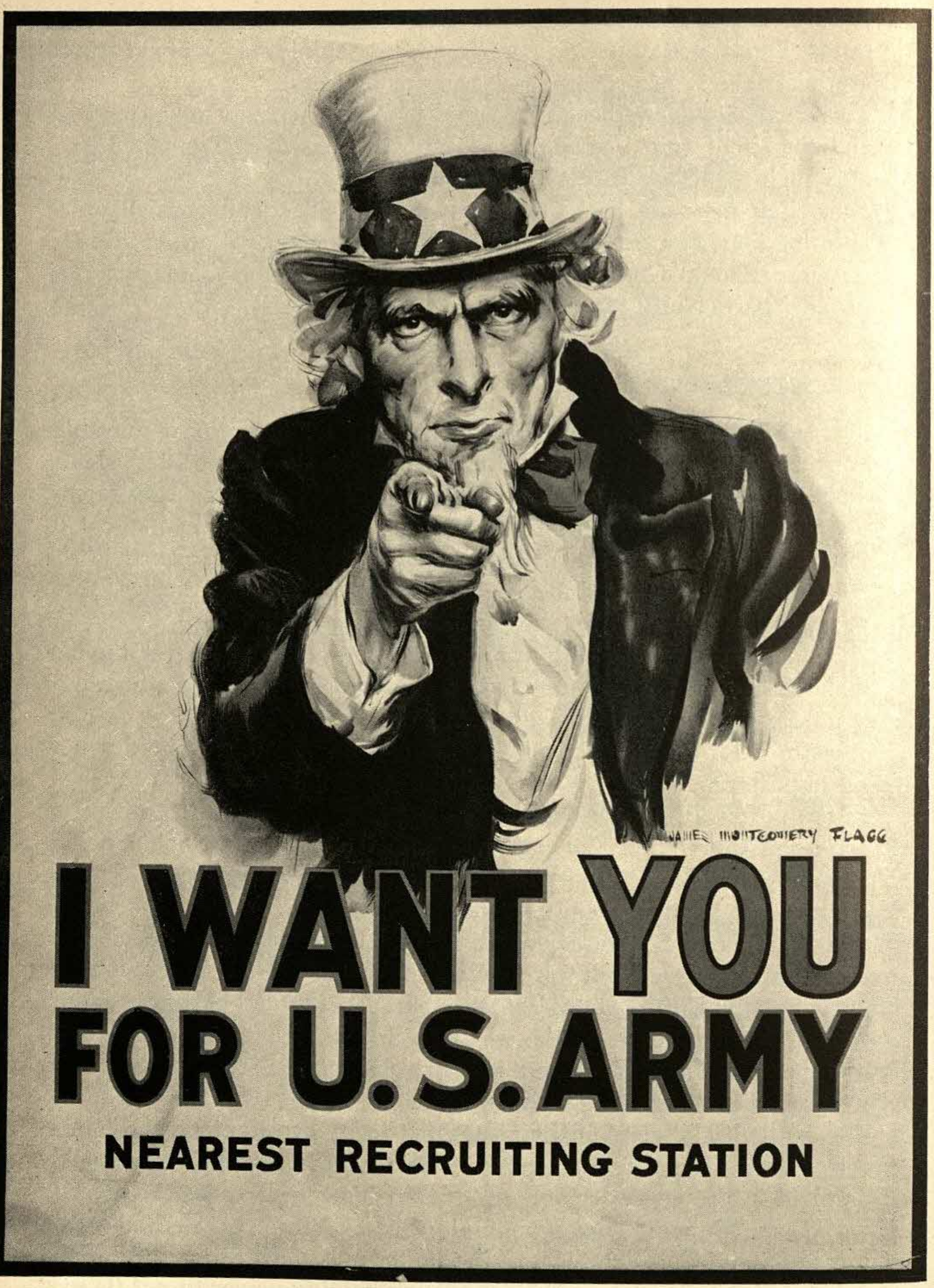


Fig. 5.15. What made this famous poster by James Montgomery Flagg highly effective as a recruiting poster?

sage across. The poster is thus defined as a *visual combination of bold design, color, and message which is intended to catch and hold the attention of the passer-by long enough to implant a significant idea in his mind.*

CHARACTERISTICS OF POSTERS

Good posters must therefore have a dynamic, impelling quality. They must be essentially simple for there is not time to involve the viewer in detailed study. They must also be striking enough to attract attention or their usefulness is lost. We shall examine several of their characteristics more closely.

Dramatic Simplicity. To attract attention, the prominent features of the poster must stand out sharply. These features may be a photograph, a drawing, or a striking design. The World War II poster (Fig. 5.15) showing Uncle Sam pointing his finger directly at the observer is unforgettable.

The eye-catcher in that poster is the head of Uncle Sam, shown against a solid blue background. His piercing eyes and pointing forefinger seem to follow and hold the observer from any angle. The drawing is vivid and striking enough to reach out and command attention. From it the eye travels quickly to the printed message below it.

Appropriateness. Not all posters carry such a high degree of the dramatic; they must rely on other means of attracting and holding attention. Advertisers make extensive use of poster techniques to call attention to their products. They naturally strive for appropriateness in subject matter, because inappropriate treatment results in a psychological letdown that defeats the poster's purpose.

It would be unsuitable, for example, to use an extremely dramatic illustration in an advertisement of soap, nylon hosiery, or baby powder. For such products advertisers often rely on universal eye-catchers like babies and attractive models. Appropriateness of the illustration to subject and purpose is characteristic of good posters.

Brief Text. Most posters rely to some extent on words to convey the specific idea or message. Two things should be remembered, however, with respect to the use of words on posters. (1) Few words are generally used, and (2) key words are made to stand out by means of type size or position. The few words in the posters in Fig. 5.16 convey the meaning to the reader more effectively than a long sentence would.

Attractiveness. Posters which are effective are usually pleasing to the eye. Although the subject may not be pleasant, as in the case of war, traffic safety, fire hazards, and the like, even in such fields posters must embody good design, good lettering, and attractive color. Other types of posters, such as those used for school courtesy and housekeeping campaigns, need to be attractive in order to be appropriate. The attractive poster is inherently pleasing and interesting, both powerful factors in learning.

Design and Color. Good composition, color, and technique are the principal elements in preparing effective posters. These elements are also applicable to flat pictures, charts, billboards, and bulletin boards—in fact, to any pictorial medium. But just as each medium has certain unique characteristics, so does it have certain unique requirements.

Like a photograph or painting, a good poster requires a center of interest, but in a poster this center needs to be particularly strong and commanding. For this reason subtlety is usually avoided in favor of unmistakable contrast and emphasis. A painting or photograph, on the other hand, frequently contains extensive detail and generally has to be studied to be fully appreciated.

Color provides meaning and expression as well as beauty in a good painting. It provides force and contrast as well as attractiveness in a good poster. Although both are essential, these uses of color are not the same. Again the distinction is based on the quite different purposes for which posters and paintings are created.

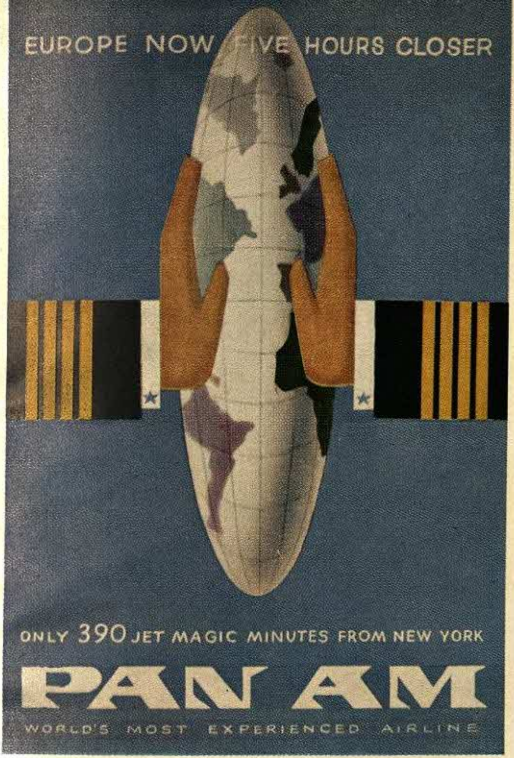
The poster thus is unique in both purpose and construction. This is not to say that poster techniques exclude the characteristics found in other visual forms. Some posters use portraits, with all their detail, as the center of interest, as in the case of the recruiting poster in Fig. 5.15. Other posters use a complete photographic background for their principal theme, or even a combination of scenes. In such instances the photographic background is normally subdued so that the message carried by the poster will stand out clearly.

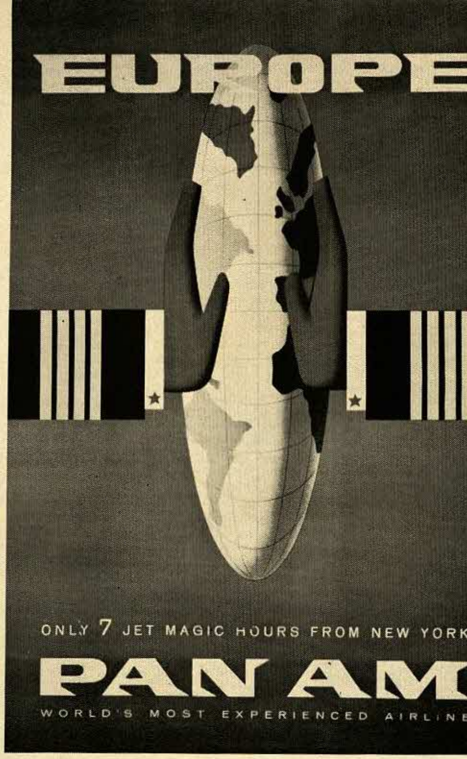
SUGGESTED USES OF POSTERS

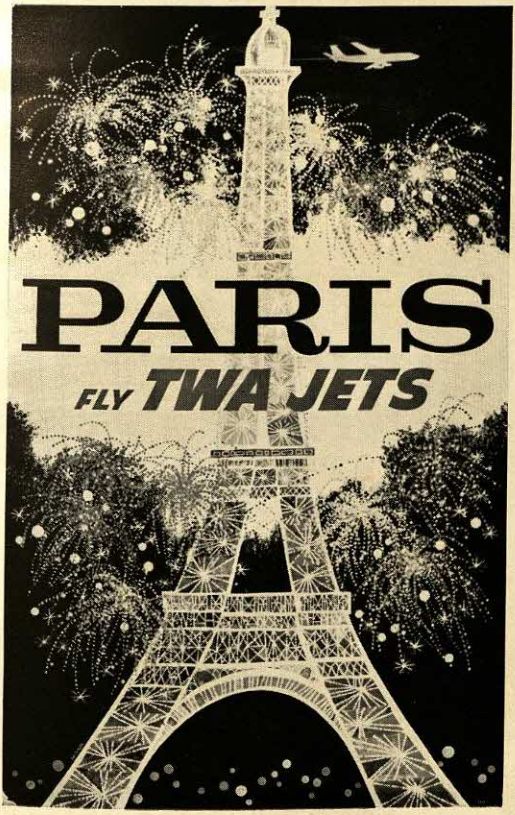
From what has been said about the poster and its purposes, several uses suggest themselves to the classroom teacher.

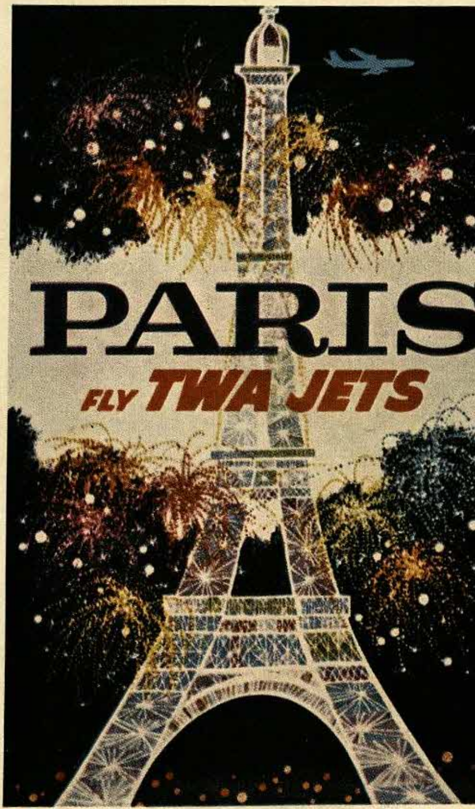
For Motivation. The first of these uses may be called motivational or stimulative. A set of good travel posters on Great Britain can be used effectively in arousing curiosity and interest in a study of modern Britain. A poster on the resort area of Bath will suggest several leads to the teacher. For example, a discussion of what the poster shows may be initiated, or other resorts may be located on a map of England. There is also an oppor-

Opposite page: Aside from excellent design built around a creative idea, note how effective posters are further strengthened by color.


EUROPE NOW FIVE HOURS CLOSER
ONLY 390 JET MAGIC MINUTES FROM NEW YORK
PAN AM
WORLD'S MOST EXPERIENCED AIRLINE


EUROPE
ONLY 7 JET MAGIC HOURS FROM NEW YORK
PAN AM
WORLD'S MOST EXPERIENCED AIRLINE


PARIS
FLY TWA JETS


PARIS
FLY TWA JETS

tunity to bring out the fact that the people enjoy some of the same recreations we do—swimming, sun bathing, and boating. Here is a possible starting point for understanding—a point of familiarity and common interest.

As Reminders. A second use of posters may be termed a reminder or awareness use. By the time he reaches the intermediate grades every child knows that brushing his teeth regularly is important. But, as teachers and parents are well aware, knowledge alone is seldom enough. There is need for frequent and varied methods of "jogging" the learner so that he will put his knowledge into practice until it becomes habitual. One means of doing this is by health posters strategically placed and frequently changed; such a poster is shown in Fig. 5.17.

Remember the remarkable ability of the human mind to become accustomed and adapted to its surroundings. Like a bulletin board which is seldom changed, the poster that is seen too often tends to become simply a part of the environment. When it loses its freshness, the poster loses its principal value—the power to attract the eye and to implant an idea.

For Atmosphere. There is a third type of use, however, in which the

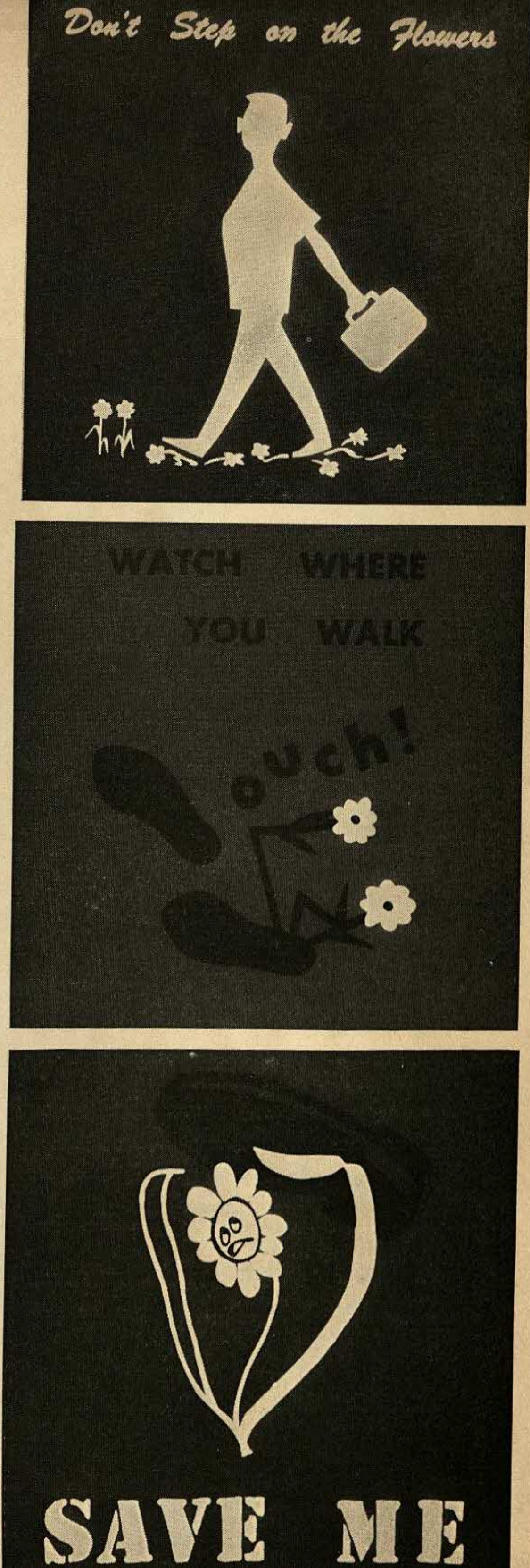


Fig. 5.16. Three posters designed for the same purpose. Analyze all three in terms of effectiveness. Which is best? Why?

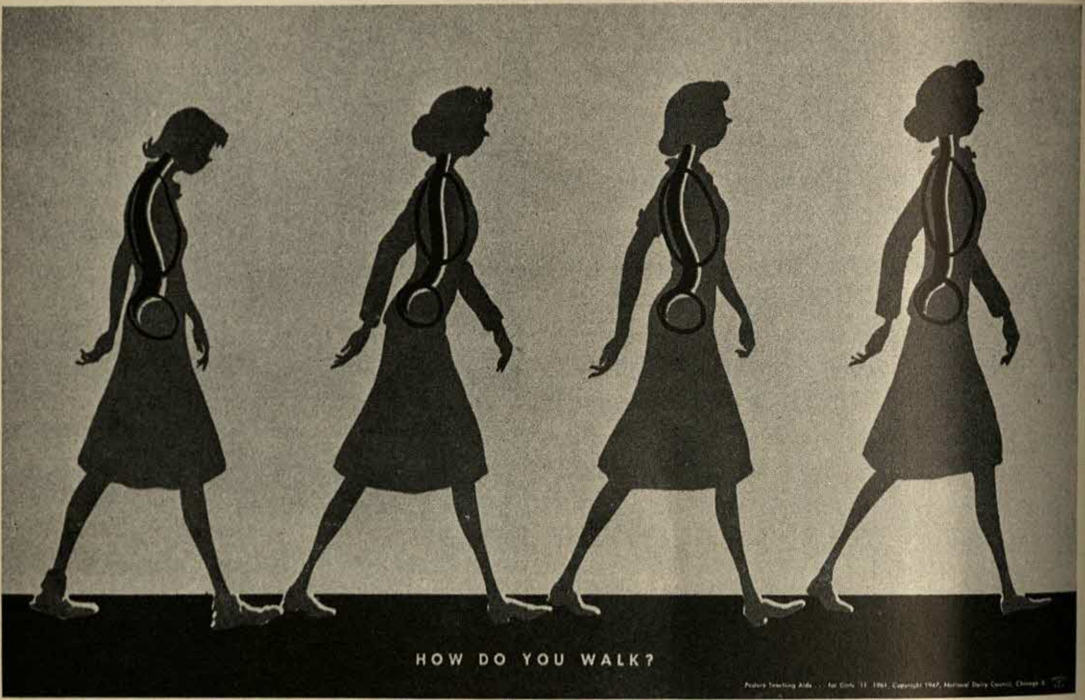

HOW DO YOU WALK?
Posture Teaching Aids . . . for Girls (1) 1961. Copyright 1947, National Dairy Council, Chicago 6.

Fig. 5.17. Posters, like other visuals, must be designed with the age level and normal interests of the intended viewers in mind. Note how this poster conveys a posture message. Is it well executed for the age group it is designed to appeal to?

poster may continue to be valuable after its initial impact has passed. This may be called the atmosphere or environmental use. Teachers of foreign languages frequently find that good posters, as well as pictures, paintings, and exhibits, assist in creating a desirable atmosphere or feeling for the country whose language is being studied. Attractive poster materials enhance this atmosphere, particularly if they are artistically good.

For Creative Experience. A fourth helpful use of posters in teaching lies in their creative and participation possibilities. They present an opportunity for the student who makes his own posters to give expression to what he has learned. In other words, the poster may be a culminating activity that arises from a unit of work. A few students in a class in English literature, for example, may prepare posters for a Shakespearian display. In studying political campaigns history students can trace interesting parallels in the political posters used at the turn of the century and those used today. Social studies committees and student councils analyzing current school problems such as playground safety, lunchroom conditions, recreational programs, and corridor traffic between classes find well-prepared posters an effective means of expressing their conclusions. Preparing these posters is also a valuable activity for the young poster artists.

For Campaigns. The above use of pupil-prepared posters in connection with class activities is closely related to a fifth use which is perhaps most familiar of all. This is the campaign or advertising use of poster materials for school activities. Election campaigns for members of the student council, class plays, athletic contests, cleanup campaigns, music festivals, forensic contests, hobby shows, and the like are "naturals" for the preparation and use of posters.

Here is an excellent opportunity for the school to capitalize on the natural drive of pupil interests to accomplish socially important and desirable objectives. If these activities are treated as an important part of the school program rather than as peripheral and extracurricular activities, much valuable educational experience can result. In this experience the poster can be properly integrated as one of the important media for communicating ideas.

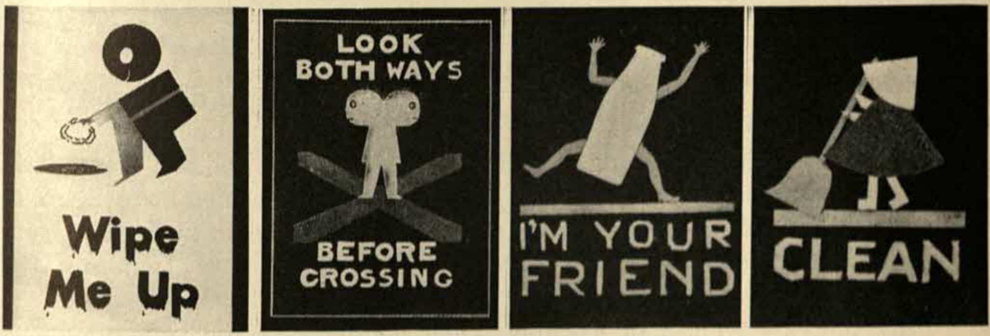


Fig. 5.18. Students' ideas flow freely if encouraged. With a bit of guidance, they can produce excellent posters like those shown here.

STUDENT-MADE POSTERS

As suggested above, pupil-made posters have much to commend them, from the standpoint of both experience and communication.

Psychologically the pupil is primarily interested in his immediate surroundings and the concerns arising from them. This is one basis for the educational principle that we must start instruction where the student *is* and build from there. This means, further, that effective instruction makes use of natural interests wherever practicable, and develops new experiences on the foundations of the old.

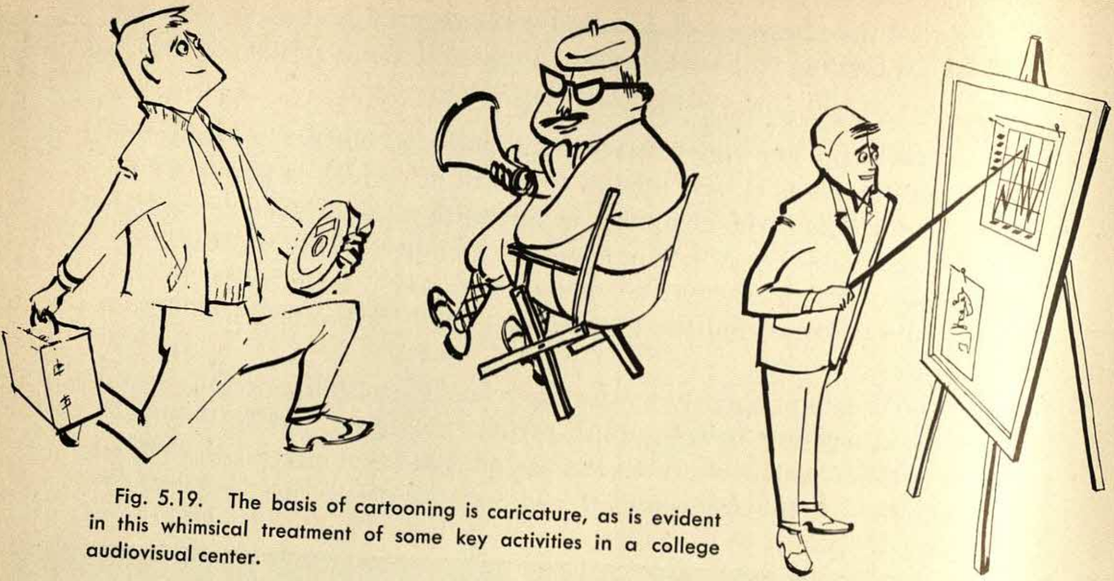


Fig. 5.19. The basis of cartooning is caricature, as is evident in this whimsical treatment of some key activities in a college audiovisual center.

The social studies teacher, in applying this principle of learning, encourages active interest in school political campaigns as one means of developing an understanding of politics in a democratic society. One of the activities implicit in such campaigns is the use of slogans, banners, mottoes, and, of course, posters. Such posters, however, cannot be bought; they must be made by the pupils. "Pupil-made posters," in the words of one social studies specialist, "represent the fruition of social concepts and measure the effectiveness of teaching. Their construction and presentation is more apt to result in personal and social growth of students than is the display of posters secured from travel or advertising agencies."[8]

The pupil-made poster likewise is well suited to publicity for such school activities as plays and athletic contests. It may well reach its maximum effectiveness in cleanup, safety, courtesy, and similar campaigns, particularly when the campaigns are pupil-initiated. Such posters as those shown in Fig. 5.18 serve as reminders and stimulaters of socially desirable action or as deterrents to undersirable behavior.

Making a good poster is not difficult. The teacher should know the qualities of a good poster and how to make one so he can help his pupils prepare their own. The art teacher is often glad to assist, for poster work provides an excellent opportunity to demonstrate that art is properly a part of daily living rather than just another subject in the curriculum.

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[8] Harris Harvill, "The Use of Posters, Charts, Cartoons, and Graphs," *18th Yearbook*, National Council for the Social Studies, 1947, p. 120.

CARTOONS

The use of the cartoon in lampooning man and his foibles goes back to the sixteenth century, when Renaissance artists began to caricature one another in their studios, as well as passers-by on the street. Archaeologists have uncovered on the walls of ancient buildings many drawings which poke fun at the great and the pretentious. Medieval manuscripts contain similar evidences of refreshing humor directed at persons and groups prominent in contemporary society. One writer has drawn an interesting analogy between the functions of the king's jester in medieval times and those of the modern cartoonist.[9]

Although a pastime at first, the possibilities offered by caricaturing for satire, comedy, and ridicule soon became recognized (Fig. 5.19). Caricatures were used initially as a form of protest against people in authority. Later there developed a visual form of social satire which dealt with groups and their composite characteristics. Eventually the two combined into what we know as the modern political-social cartoon.

The modern political-social cartoon developed in the United States during the nineteenth century.[10] Andrew Jackson and his spoils system were among the first subjects of political caricature. Later, in the 1860's, Thomas Nast conducted his famous cartoon campaign against the notorious Tweed Ring in New York. It was Nast who created the now standard symbols of the Democratic donkey and the Republican elephant. Nast and Joseph Keppler, the latter the originator of the famous cartoon character "Puck" during the same period, set a pattern of attack against individuals as a means of getting at important issues. This pattern still characterizes most American cartoons on political and social subjects.

The serious cartoon is *a pictorial representation or caricature of a person, idea, or situation that is designed to influence public opinion.* Although an increasing number of excellent cartoons are intended merely to make people chuckle—as is true of those in *The Saturday Evening Post,* for example—it is the cartoon as an instrument of propaganda that has the chief potentialities in teaching. It is the latter type with which the following discussion is concerned.

ESSENTIAL CHARACTERISTICS OF CARTOONS

A good cartoon is built around a single idea. Typically it may employ caricature, satire, exaggeration, symbolism, and humor of a sort. The humor may and frequently does extend to outright ridicule, particularly in cartoons on controversial political subjects in highly partisan newspapers. In some cases the extensive use of cartoons on political and social subjects has given this medium an abusive characteristic typified by personal attacks on high-placed officials.

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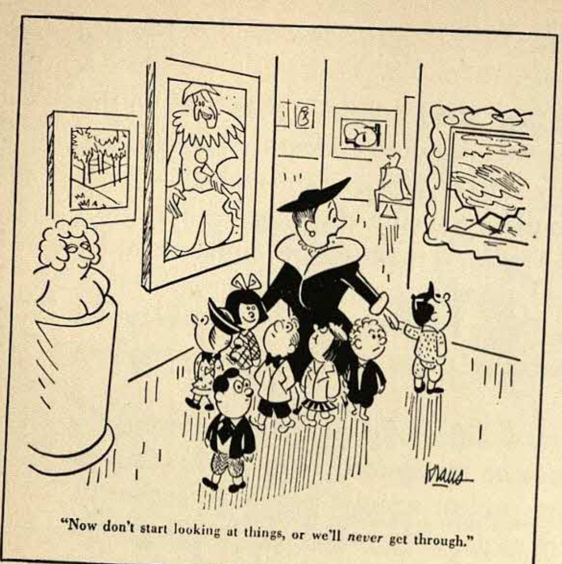
[9] Albert J. Nock, "The King's Jester: Modern Style," *Harper's Magazine,* March, 1928, pp. 481–488.

[10] *Ibid.,* p. 482.



"Now don't start looking at things, or we'll *never* get through."

Fig. 5.20. For whom is this cartoon designed?

The power of the cartoon to influence public opinion lies in its compactness, its simplification of issues, and the considerable interest that can be aroused by sharply drawn illustrations laced with humor. It is a predigested source of information with a strong visual impact. Many persons who may not read a newspaper's editorials follow its cartoons regularly. Thus it is that the militant cartoonist on large metropolitan newspapers is regarded as a potent factor in forming public opinion.

EVALUATION AND SELECTION OF CARTOONS

The answer to the question "What is a good cartoon?" is somewhat elusive, because a cartoon is so much a product of the creative imagination, skill, and individuality of the cartoonist. Yet there are certain qualities which are typical of effective cartoons, and knowledge of these qualities is helpful in selecting cartoons for teaching purposes.

Appropriateness to Experience Level. The first consideration, of course, is that the meaning of the cartoon be understandable by the class in which it is to be used. A cartoon on foreign aid or the cold war, for example, will have little meaning for a sixth-grade pupil who has not studied these topics. Likewise, while many teachers will get a chuckle out of Fig. 5.20, few youngsters will see its humor. The same pupils, on the other hand, may readily interpret a fairly subtle cartoon on traffic safety or sportsmanship.

Schaffer's study of children's interpretations of social and political cartoons found that, on the average, children begin to interpret such cartoons abstractly at about age 13. The range of greatest increase in percentage of abstract response to symbolic drawings occurs between Grades 6 and 8.[11]

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[11] Laurence W. Schaffer, *Children's Interpretation of Cartoons*, Bureau of Publications, Teachers College, Columbia Univ., New York, 1930, pp. 51–52.

An analysis of erroneous interpretations, furthermore, showed that the absence of meaning of word elements in cartoon captions—in other words, lack of a background adequate to give correct meaning to the words used—was a particular cause of error.[12]

Simplicity. Assuming that the cartoon's meaning is understandable, there are certain desirable physical characteristics common to good cartoons. One of these is simplicity. Generally speaking, the better cartoons contain only essentials; they depend more on key characteristics for recognition than on extensive photographic detail. Uncle Sam's top hat and striped trousers, President Kennedy's hair, and Castro's beard are familiar examples. A few sharp lines, some shading, and the necessary background sketched in lightly are the principal mechanical ingredients of a good cartoon. The creative artistry and imagination of the cartoonist are evidenced by the overall effect he can attain with these physical elements and an idea.

Another physical characteristic is brevity of caption. Some cartoons need no caption, the picture itself conveying the idea without verbal assistance. Although the political-social cartoon usually requires a caption, it should be clear, brief, and to the point. Extensive explanation is unnecessary if the cartoon is well conceived and well executed.

Clear Symbols. A third quality of effective cartoons is clarity of symbolic meanings. John Bull, Uncle Sam, the Republican elephant, and the Democratic donkey are standard cartoon symbols whose meanings are well understood by the newspaper-reading public generally. Such characterizations as the burdened taxpayer, the opulent business mogul, the unemployed workman, the laboring man, and the "politician" are also understood without difficulty if the rendition is good. Symbols representing more abstract concepts such as states' rights, humanity, the "common man," tariff walls, "one world," and freedom, on the other hand, are more difficult to devise. Here the cartoonist's ability is challenged to the utmost. Accordingly, teachers must be careful to select cartoons whose symbols are not too abstruse for their pupils.

SUGGESTED USES OF CARTOONS

For Motivation. By its nature an effective cartoon readily attracts attention and arouses interest. This suggests at once that appropriate cartoon materials can be useful motivation devices in the classroom. Cartoons on current topics, if suited to lesson objectives, are effective discussion starters. Such questions as "What does this cartoon mean?" "Does it tell the whole story?" and "What other cartoons have you seen on this subject?" can start the ball rolling quickly in a junior- or senior-high-school social studies class.

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[12] *Ibid.*, p. 66.

The humor in cartoons has great stimulative benefit, even for students of limited ability, according to a teacher of modern foreign languages in the Benjamin Harrison High School in New York. Cartoons selected from French magazines elicited great interest, built vocabulary and confidence in using it, stimulated conversation, and generally increased pupil participation in French classes. The cartoons without captions were of particular motivational value: "The *sansparoles* proved even more interesting because while some of the captional cartoons had sometimes required an explanation by the instructor, in the latter case the explanations came from the students who were eager to give us their own. Consequently this type was used as a motivating device for short compositions."[13]

Generally speaking, cartoons selected for specific purposes and for appropriate levels of sophistication can at the very least provide a refreshing tie-in with life outside the classroom, plus a stimulating variety and change of pace in instructional techniques. At best, and in many subjects, cartoons can open up a whole range of worthwhile learning activities.

As Illustrations. One teacher reports effective results from using cartoons to illustrate scientific concepts in teaching science.[14] Some he uses to raise such questions as whether the situations pictured are scientifically possible or probable. Others illustrate drawing errors such as giving insects only two legs. Still others show the result of disregarding safe practices or the scientific method; this is done by asking the students what is wrong in the situation illustrated. This teacher emphasizes the necessity of selecting cartoons carefully so as to avoid purely humorous reactions among pupils on the one hand, and, on the other, pointless attention to details that are unrelated to the cartoonist's purpose.

A college physics teacher reports that for many years he has had his students on the lookout for cartoons which illustrate physical principles. They write an appropriate title and bring the cartoon to class. "Very often," he says, "a good discussion of physics comes out of debating how best to title one. . . . It is all an exciting exercise for my students—and for me—and invites participation irresistibly."[15]

One example this teacher cites indicates that cartoon analysis can reach some fairly complex levels.

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[13] René Merker, "Cartoons in High School Classes," *Modern Language Journal,* December, 1957, pp. 398–399.

[14] John D. Wollever, "Using Cartoons in the Classroom," *School Science and Mathematics,* April, 1950, pp. 255–258.

[15] Julius Sumner Miller, "Cartoons and Physics Instruction," *American Journal of Physics,* April, 1960, pp. 406–407.

A mason is building a brick chimney from the ground up. On each side of the site rests a carpenter's horse and across these a plank. On the plank he has put a load of bricks so that the plank is bent in the middle. As he uses the bricks, the plank *unbends,* thus raising the bricks to the level of his work! The artist obviously knew Hooke's law. He may even know that the depression of a beam is given by $d = \frac{FL^3}{4} Yab^3$. He may even have known the equation of an elastic curve, $EI\,(d^2y/dx^2) = M_x$.[16]

A general science instructor might find the cartoon shown in Fig. 5.21 a new way to explain the role of friction in relation to movement. Cartoons provide teachers with two valuable assets—good illustrations of significant learning points, and change of pace and variety in presentation of material to the class.

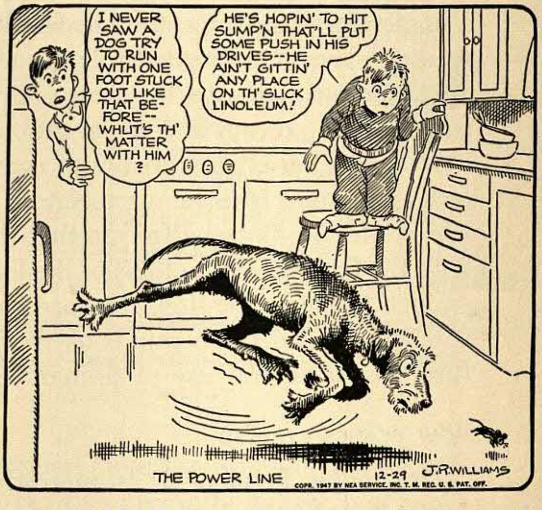
I NEVER SAW A DOG TRY TO RUN WITH ONE FOOT STUCK OUT LIKE THAT BEFORE -- WHUT'S TH' MATTER WITH HIM ?
HE'S HOPIN' TO HIT SUMP'N THAT'LL PUT SOME PUSH IN HIS DRIVES--HE AIN'T GITTIN' ANY PLACE ON TH' SLICK LINOLEUM!
THE POWER LINE
12-29
J.R.WILLIAMS
COPR. 1947 BY NEA SERVICE, INC. T. M. REG. U. S. PAT. OFF.

Fig. 5.21. Cartoons may combine humorous appeal with scientific principles.

For Pupil Activity. Another type of cartoon use involves the creation of cartoons by the students themselves. Pupils make cartoons to enliven interest in cleanup campaigns and safety drives. The student council finds cartoons particularly well suited as reminders of courtesy, sportsmanship, and lunchroom behavior campaigns. Such devices, created by the pupils and containing the type of humor suited to their stage of maturity, are psychologically sound. They are likely to be effective even though inexpert in execution.

Classroom production of pupil cartoons is likewise a useful activity. The social studies are a constant source of ideas suitable for cartoons. Literature and grammar also provide opportunities for drawing cartoons as illustrations of the knowledge acquired.[17]

COMICS

Closely related to the cartoon is the comic strip.

The comics are very much with us. Estimates have placed the readers of comics in the United States at well over 100,000,000. According to Ayer, some 48,000,000 comic books are published on a weekly, biweekly, or monthly basis in this country and Canada alone.[18] Translated into many languages, they are widely read in more than 100 countries.[19] The immense popularity which comics have attained can be attributed partly to the need felt by millions of people of all ages for humor, gaiety, and entertainment. Whether educators and parents are inclined to approve of comics, all will agree that this medium of communication has become firmly established in our society.

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[16] *Ibid.*

[17] Edith E. Mains, "The Cartoon and the Teaching of Grammar," *English Journal,* April, 1945, pp. 506–507.

DEFINITION AND CHARACTERISTICS OF COMICS

Comics may be defined as *a form of cartooning in which the same cast of characters enacts a story in a sequence of closely related drawings designed to entertain the reader*. Whereas the cartoon depends primarily upon a single visual impact, comics consist of continuing story situations in which reading plays an important role. Another distinction is the fact that comics are humorous, whereas the most unique and significant contribution of the cartoon is in politics and social problems rather than in entertainment.

Several other characteristics of comics should be recognized if the force of this medium is to be appreciated. Comics focus on people (Fig. 5.22). The stories are personalized so that the reader can readily identify himself with the feelings and actions of the leading characters. The stories are brief enough to hold attention, they are packed with action, and in the Sunday supplement and the comic book they are made more vivid and appealing through the liberal use of primary colors.

HOW COMICS STARTED

Newspaper Rivalry. It is interesting to note that comics received their initial impetus from a newspaper war between William Randolph Hearst and Joseph Pulitzer in the mid-1890's. Colored supplements to the Sunday issues of the New York *Journal* and the New York *World* vied mightily with each other to build circulation.[20]

A significant part in this rivalry was played by funny drawings involving a character who came to be known as "The Yellow Kid." This sketch achieved rapid popularity and accordingly increased the circulation of Pulitzer's New York *World*. Within six months Hearst came out with a new comic section, ". . . eight pages of iridescent polychromous effulgences that make the rainbow look like a piece of lead pipe." Headlining his cast of char-

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[18] William F. McCollister (ed.), *Directory to Newspapers and Periodicals*, Ayer & Sons, Philadelphia, 1961, p. 1388.

[19] Paul A. Witty and Robert A. Sizemore, "Reading the Comics: A Seminar of Studies and an Evaluation," *Elementary English*, December, 1954, p. 502.

[20] Coulton Waugh, *The Comics*, Macmillan, New York, 1947, pp. 6 ff.

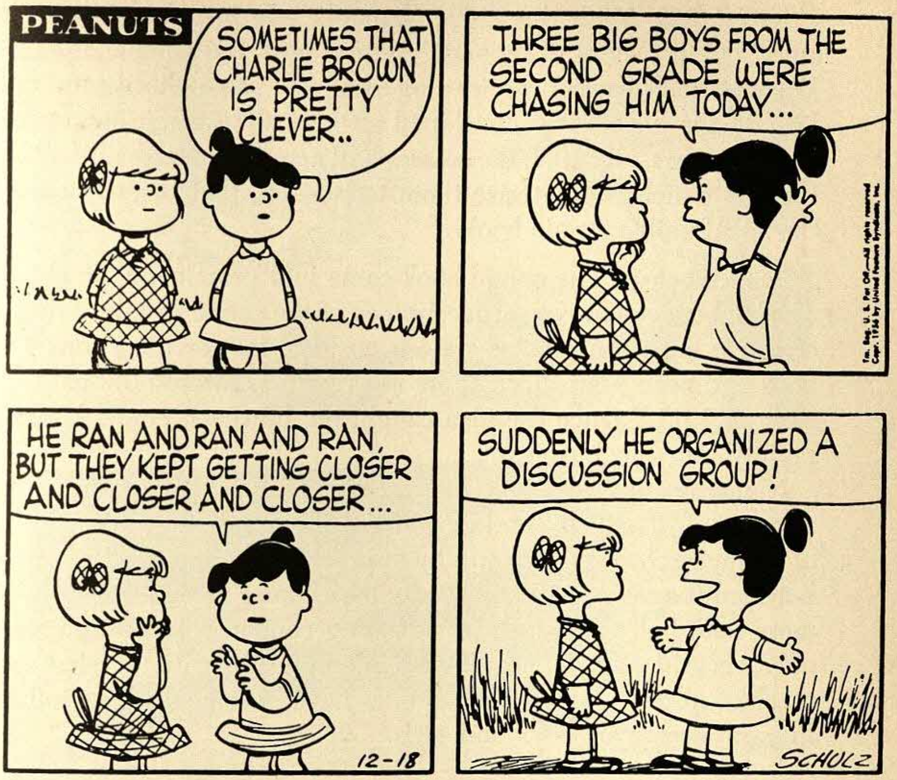
PEANUTS
SOMETIMES THAT CHARLIE BROWN IS PRETTY CLEVER..
THREE BIG BOYS FROM THE SECOND GRADE WERE CHASING HIM TODAY...
Tm. Reg. U. S. Pat. Off.—All rights reserved
Copr. 1956 by United Feature Syndicate, Inc.
HE RAN AND RAN AND RAN, BUT THEY KEPT GETTING CLOSER AND CLOSER AND CLOSER...
12-18
SUDDENLY HE ORGANIZED A DISCUSSION GROUP!
SCHULZ

Fig. 5.22. Comics, like advertising, take advantage of people's natural interests. How might you paraphrase this one?

acters was "The Yellow Kid," for Hearst had hired the original comic artist and his creation away from the *World*. Pulitzer promptly bought him back, but was again outbid by Hearst. Thereupon Pulitzer hired another artist and for a time both papers attempted to outdo each other with independent versions of the vulgar, raucous "Kid."[21] The yellow color of the strip and the notoriety arising from the contest between the two newspapers gave rise to the term "yellow journalism."

The significant point of this anecdote is that the initial purpose of comics was to build newspaper circulation. In the process, comics became firmly embedded in the consciousness of the American public. It is worth noting that their purpose is still primarily commercial—to sell newspapers and comic books.

Comic Strips. New comics were quickly created. "Buster Brown" and "The Katzenjammer Kids," the longest-lived of all comics, appeared by the close of 1902. With the Katzenjammers was introduced the play-by-play story told in a series of separate pictures with the same characters. Another artist carried forward the idea of using the same characters, added frame lines to the boxes, and developed an appealing comic-strip personality in "Little Jimmy." By 1905 the comics had acquired practically all the physical features which characterize them today—all, that is, except the format of the now familiar comic book.

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[21] *Ibid.*

Comic Books. The comic book came into prominence in the mid-1930's. The lag between universal acceptance of the comic strip and the appearance of comic books on a large scale is curious, for early versions of the comic book had been used successfully as premiums in promotional campaigns as early as 1911.[22] Once the idea caught on, however, comic books developed rapidly into big business.

Numerous circulation studies have indicated that comic books are read almost universally by children in the intermediate grades, by nearly half of all high-school pupils, and by approximately one-third of our population between the ages of 18 and 30. By their junior or senior year in high school more than half the pupils stop reading comic books entirely or read them only occasionally. These studies merely substantiate what parents and teachers already know—that comics have become a major influence in the lives of American boys and girls.

USE OF COMICS IN INSTRUCTION

The extensive popularity of comics has led many teachers to experiment with this medium in teaching. Much of this experimentation has been done in the language arts at the intermediate and junior-high-school level, although similar experiments in science, history, the social studies, and even religious education are not uncommon. Fig. 5.23 shows comic techniques applied to information in the field of television.

An analysis of the language of the comics by Thorndike[23] indicated several points of interest. Perhaps the most significant of these is the finding that a child who reads one comic book per month will read approximately twice as many words per year as his reading book contains. Thorndike concluded that both the amount and the character of the vocabulary provided valuable practice in reading for the young reader.

The unique contribution of the comics as compared to that of printed text was investigated by Sones.[24] In an exploratory study with 400 sixth- and

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[22] *Ibid.*, pp. 335–340.

[23] Robert L. Thorndike, "Words and the Comics," *Journal of Experimental Education*, December, 1941, pp. 110–113.

[24] W. W. D. Sones, "The Comics and Instructional Method," *Journal of Educational Sociology*, December, 1944, pp. 238–239.

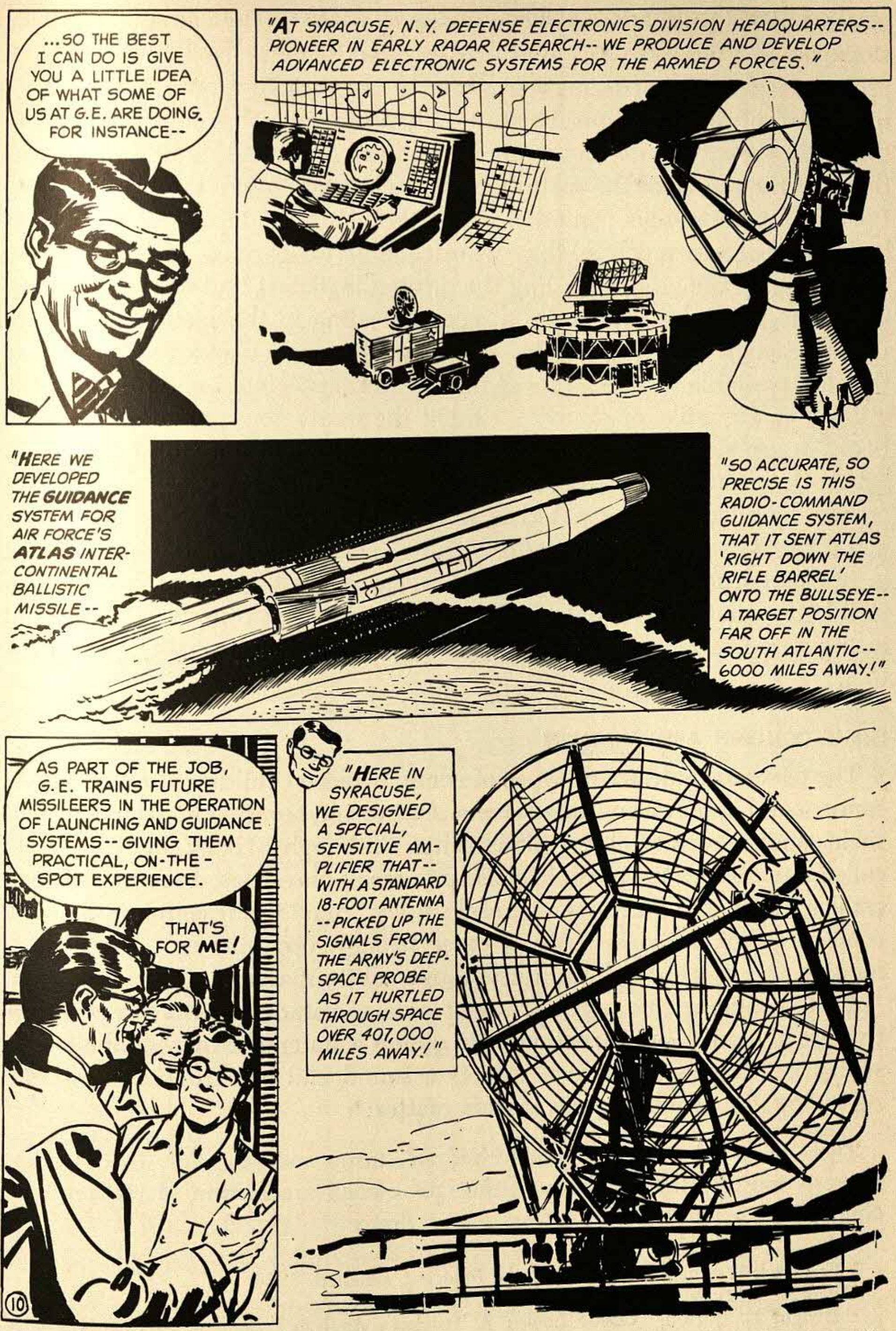
...SO THE BEST I CAN DO IS GIVE YOU A LITTLE IDEA OF WHAT SOME OF US AT G.E. ARE DOING. FOR INSTANCE--
"AT SYRACUSE, N.Y. DEFENSE ELECTRONICS DIVISION HEADQUARTERS--PIONEER IN EARLY RADAR RESEARCH-- WE PRODUCE AND DEVELOP ADVANCED ELECTRONIC SYSTEMS FOR THE ARMED FORCES."
"HERE WE DEVELOPED THE GUIDANCE SYSTEM FOR AIR FORCE'S ATLAS INTERCONTINENTAL BALLISTIC MISSILE--
"SO ACCURATE, SO PRECISE IS THIS RADIO-COMMAND GUIDANCE SYSTEM, THAT IT SENT ATLAS 'RIGHT DOWN THE RIFLE BARREL' ONTO THE BULLSEYE-- A TARGET POSITION FAR OFF IN THE SOUTH ATLANTIC-- 6000 MILES AWAY!"
AS PART OF THE JOB, G.E. TRAINS FUTURE MISSILEERS IN THE OPERATION OF LAUNCHING AND GUIDANCE SYSTEMS-- GIVING THEM PRACTICAL, ON-THE-SPOT EXPERIENCE.
THAT'S FOR ME!
"HERE IN SYRACUSE, WE DESIGNED A SPECIAL, SENSITIVE AMPLIFIER THAT-- WITH A STANDARD 18-FOOT ANTENNA --PICKED UP THE SIGNALS FROM THE ARMY'S DEEP-SPACE PROBE AS IT HURTLED THROUGH SPACE OVER 407,000 MILES AWAY!"
10

Fig. 5.23. The appeal of comic books transfers to some extent to their use in information fields. Might this subject matter appeal to students? If so, at what age levels?

ninth-graders he used the comic magazine *Wonder Woman* as one approach to the life and work of Clara Barton. A printed text was used for his control groups. He found that mean scores among the picture groups ran from 10 to 30 percent higher on the first test. When the control groups were given the picture story, their scores on the second test improved significantly more than did the scores of the picture groups who were given the printed text. In summary Sones says, "In other words the picture groups seemed to have learned almost as much as they were capable of learning from their first reading while the groups reading the printed texts first had not reached the saturation point, but did so by a second reading in the picture form."

The teacher who uses comics in any of the curricular areas for which they are available will be aware of the need for applying sound principles of utilization. He will, for example, exploit the motivating potential of comic books in getting units off to a good start, but he will not stop there (Fig. 5.24). Once interest has been aroused, the picture story can be supplemented by other reading materials, films, flat pictures, models, experiments, and a variety of creative activities. The principal merit of the comic book in instruction may be its capacity to create interest—interest, as teachers well know, that is essential to effective learning. If properly selected and incorporated in teaching methods, the comic can be an effective teaching tool.

PUBLIC CONCERN ABOUT COMICS

The effect of undesirable types of comic books on children arouses public concern and action from time to time. As a result, several cities have barred such comics from sale at various times. Although a book by Wertham[25] called attention to the possible consequences of unrestricted reading of such comics, Witty and Sizemore's careful survey[26] of all the research in the field concludes that the views both of those strongly opposing and of those defending the comic medium are without substantiation.

Burton suggests the need for a wholesome attitude toward the constructive use of comics in instruction.[27] He quotes a statement by the faculty of a school in Minneapolis which reflects a sound and constructive viewpoint regarding the teacher's role in this matter:

> Those of us who hope to guide children's tastes and especially their reading interests must certainly take note that the comics are a form of reading each child takes to without coaxing. . . .

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[25] Frederick Wertham, *Seduction of the Innocent*, Rinehart, 1954.

[26] Paul A. Witty and Robert A. Sizemore, *op. cit.*

[27] Dwight L. Burton, "Comic Books: A Teacher's Analysis," *Elementary School Journal*, October, 1955, pp. 73–75.

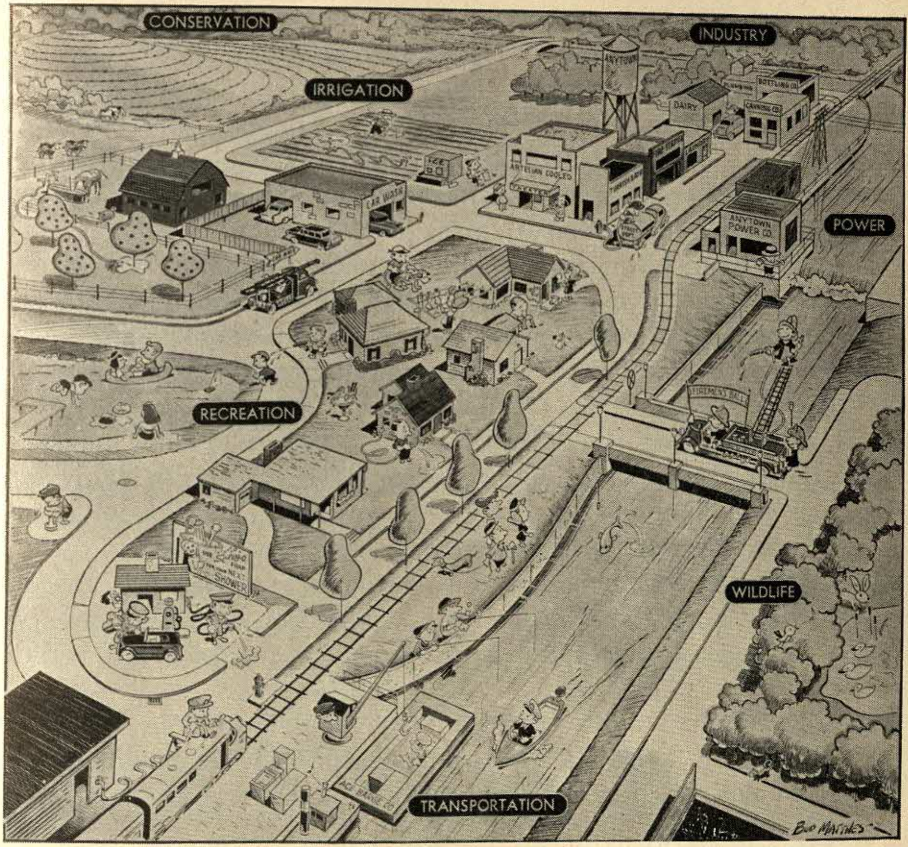

Fig. 5.24. Because of its wide appeal, the comic technique is often applied to serious explanations. In what classroom situations do you feel that the comic technique, used as in this explanation of water and its importance to us, is justified?

With adult guidance, comics may serve as a bridge to the reading of more lasting books. We must help our children discover good books that are exciting, too, and teach them to discriminate among comic books; then we may safely accept our children's comic reading for what it is,—a stage in their growth—, provided we also help them toward wider horizons of interest and appreciation.[28]

SUMMARY

Graphic materials may be defined as materials which communicate facts and ideas clearly and succinctly through a combination of drawings, words, and pictures. They are particularly well suited to the presentation of information in condensed summary form; the presentation of quantitative information as on graphs; the illustration of relationships as on charts, maps, graphs, and diagrams; and the representation of some kinds of abstractions as in cartoons, diagrams, and charts.

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[28] *Guide to the Teaching of Reading in the Elementary School,* Division of Elementary Education, Minneapolis Public Schools, 1950, p. 130.

The types of graphic materials commonly employed in teaching include graphs, diagrams, charts, posters, cartoons, and comics. Each type has certain unique instructional applications.

Graphs are visual representations of numerical data. They show quantitative relationships more effectively than any other medium, but like diagrams, they require a background of experience and information to be effective as teaching devices. Typical forms are line graphs, bar graphs, and pictorial graphs.

Diagrams are simplified drawings designed to show interrelationships primarily by means of lines and symbols. Diagrams are highly abstract and have a minimum of detail; hence they require a background of information before they can be used effectively with students.

Charts are combinations of various graphic and pictorial media designed to visualize relationships between key facts or ideas in an orderly and logical manner. Typical forms are the tree chart, the flow chart, and the tabular chart.

Posters are large-scale simplified pictorial illustrations designed to attract attention to key ideas, facts, or events. They are inherently simple and dynamic. Their function is primarily to motivate, arouse interest, remind, or advertise.

The cartoon is a pictorial representation or caricature of a person, idea, or situation designed to influence public opinion. Political cartoons are sources of information with a strong visual impact based upon sharp, compact drawings and humor of some type. There is some evidence that cartoons are chiefly valuable for teaching at the secondary rather than the elementary level partly because most commercial cartoons are prepared for adult readers.

Comics are a form of cartoon in which the same characters enact a story in a sequence of closely related pictures designed to entertain the reader. Although comics have achieved extensive popularity purely as an entertainment medium, certain materials in this category have definite educational values. Their extensive use of colorful illustrations, of a rapidly moving story, and of realistic people as characters appeals to students of all ages. Comic books are being used effectively by teachers to arouse interest, to develop vocabulary and reading skills, and to serve as springboards into broader reading interests.

Suggested Activities

1. Analyze a typical unit of work in your teaching field and prepare a list of points at which graphic materials would provide unique teaching values.
2. For a specific unit of work in your teaching field in which graphic materials are applicable, develop a lesson plan incorporating graphics, teach it, and report your results to your audio-visual class.
3. Divide the class into committees and have each committee select and evaluate the best examples it can find of one type of graphic material. Consider such points as (a) standards to be observed in selection, (b) sources of suitable materials, and (c) costs.
4. From the members of your class, obtain charts, graphs, diagrams, posters, and cartoons prepared by elementary and high-school pupils. Investigate the learning situation in each case and attempt to assess the educational values derived. Through group discussion formulate a set of principles which will be helpful in determining when and to what extent pupils should prepare graphic materials.
5. Make a committee survey of comic-book materials being sold at key newsstands in your community. Find which comics are best-sellers, which are objectionable (and why), and which are useful from an educational standpoint. Prepare suitable graphic materials for use in presenting your findings.
6. On the basis of the information secured for the preceding survey, draw up a P.T.A. program to consider the comic-book situation in your community. Plan the program so as to include both pros and cons in the discussion.
7. Have a committee of class members investigate sources of free or inexpensive graphic materials, prepare an exhibit of sample materials, and make classified lists of sources for distribution to your class.
8. Request members of the class to bring in and explain their use of graphic materials which they have found particularly helpful in their teaching.

Bibliography

Arkin, Herbert, and Colton, Raymond R., *Graphs, How to Make and Use Them,* Harper, rev. ed., 1940.

Brackman, Walter, "Cartoons in the English Class," *Clearing House,* January, 1956, pp. 268–270.

Brinton, Willard C., *Graphic Presentation,* Brinton Associates, 1939.

Brown, J. W., Lewis, R. B., and Harcleroad, F. F., *Audio-Visual Instruction,* McGraw-Hill, 1959, pp. 333–350.

Burton, Dwight L., "Comic Books: A Teacher's Analysis," *Elementary School Journal,* October, 1955, pp. 73–75.

Clark, R. M., "Charts and Graphs," *American Vocational Journal,* February, 1956, pp. 19–20.

Dale, Edgar, *Audio-Visual Methods in Teaching*, Dryden, rev. ed., 1954, pp. 319–323.

Entin, J. W., "Using Cartoons in the Classroom," *Social Education*, May, 1958, p. 109.

Haas, Kenneth B., and Packer, Harry Q., *Preparation and Use of Visual Aids*, Prentice-Hall, 3rd ed., 1956.

Harvill, Harris, "The Use of Posters, Charts, Cartoons, and Graphs," *18th Yearbook*, National Council for the Social Studies, 1947, pp. 109 ff.

Hoban, Charles F., Hoban, Charles F., Jr., and Zisman, Samuel B., *Visualizing the Curriculum*, Dryden, 1937, pp. 240–258.

Hogben, Lancelot, *From Cave Painting to Comic Strip*, Chanticleer Press, 1949.

Kinder, James, *Audio-Visual Materials and Techniques*, 2nd ed., American Book, 1959, pp. 378–406.

Modley, Rudolf, *How to Use Pictorial Statistics*, Harper, 1937.

Sands, Lester B., *Audio-Visual Procedures in Teaching*, Ronald, 1956, pp. 204–233.

Sinnema, J. R., "Cartoons in Conversation Classes," *Modern Language Journal*, March, 1957, pp. 124–125.

Waugh, Coulton, *The Comics*, Macmillan, 1947.

Witty, Paul A., and Sizemore, Robert A., "Reading the Comics: A Summary of Studies and an Evaluation," *Elementary English*, December, 1954, pp. 501–506; January, 1955, pp. 43–49; February, 1955, pp. 109–114.

Films and Filmstrips

Action, B&W, 10 min., Library Films.

Animals, B&W, 20 min., Library Films.

Creating Cartoons, B&W, 10 min., Bailey Films.

Figures, B&W, 20 min., Library Films.

Funny Business, B&W, 18 min., McGraw-Hill.

Graphs (35mm. filmstrip), 54 frames, B&W, Society of Visual Education.

Heads and Expressions, B&W, 20 min., Library Films.

How to Make a Silk Screen Print, B&W, 20 min., Almanac Films.

Language of Graphs, B&W, 13 min., Coronet Films.

Making a Serigraph, Color, 30 min., Harmon Foundation.

Of the People For the People, B&W, 14 min., Films of the Nations, Inc.

Poster Making: Design and Technique, Color, 10 min., Bailey Films.

Poster Making: Printing by Silk Screen, Color, 14 min., Bailey Films.

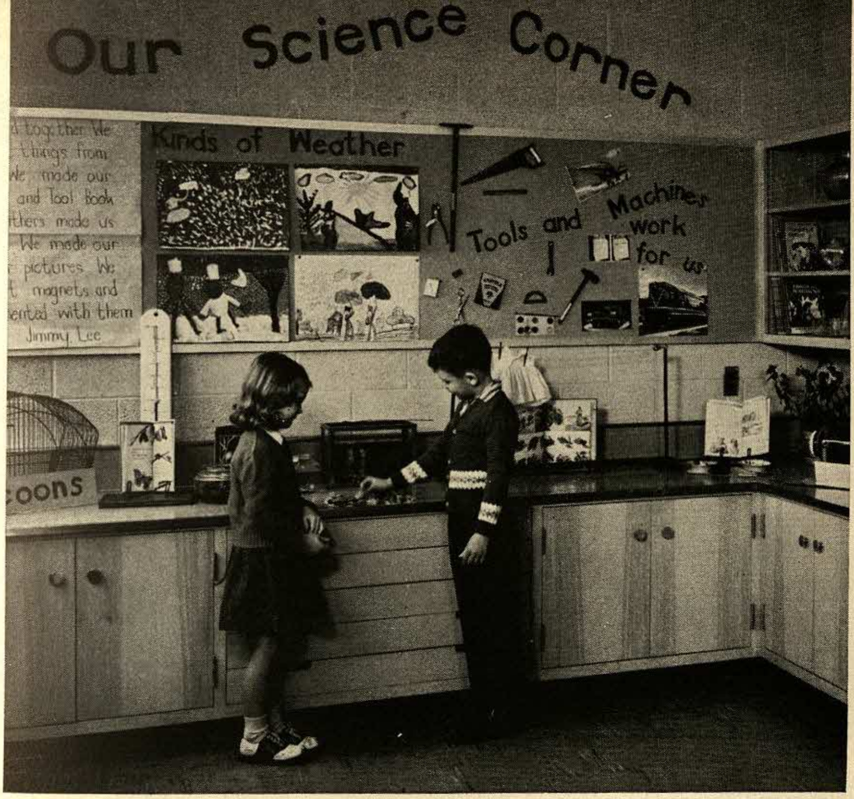
Silk Screen Process, B&W, 20 min., Library Films.

Silk Screen Textile Printing, Color, 11 min., Bailey Films.

Using Graphs and Charts in Teaching (35mm. filmstrip), 51 frames, Color, Basic Skill Filmstrips.

Wet Mounting, Color, 10 min., Indiana University.

What Is a Graph? (35mm. filmstrip), 26 frames, B&W, Visual Education Consultants, Inc.



CHAPTER 6

THE STUDY DISPLAY

THE PUPILS' SCHOOL WORLD is centered in the classroom, and every part of it can be used by an imaginative teacher as a means whereby curious-minded learners achieve specific study goals. The ceiling is not solely a ceiling; it is a place from which to hang object displays of the solar system, the latest paper models of aircraft, space platforms, and rockets, and mobiles of graphic materials. The floor is more than a floor; it can provide space for setting up study situations for arithmetic and measurement—the blocks of tile, the angles at which chair and table legs meet the floor, the areas of the floor used for seating, work space, entrance,

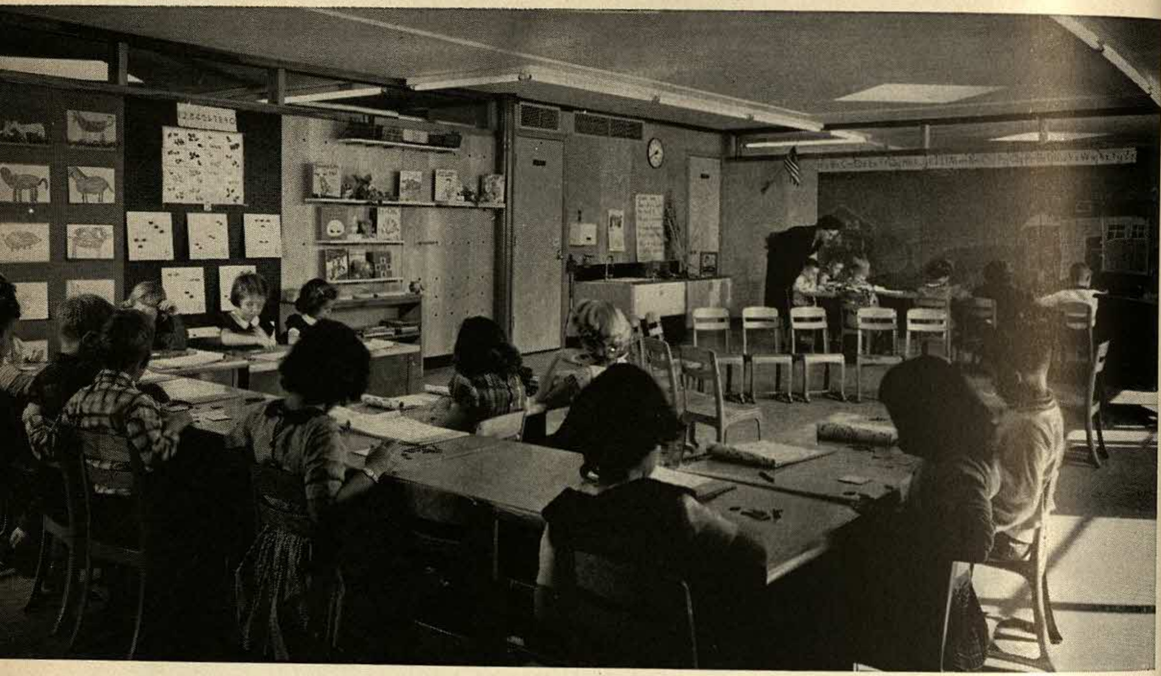


Fig. 6.1. How does this use of study display space relate to learning and achievement in this classroom? The corkboard area? The pegboard? The adjustable shelf? The mural area? What kind of pupil-teacher planning does this imply?

exit. The walls need not be merely a means of holding up the roof; they can carry study displays—arrangements of pictures, graphics, and three-dimensional materials which relate to the study goals being sought by the class (Fig. 6.1). Not only is the study display a useful learning experience; its value goes beyond this, for it helps to create an atmosphere or environment for learning.

Project display walls are a new concept of the study display, a concept which assumes that classroom walls can become a truly functional part of learning. A person who enters a classroom in the recently built Baylass High School in St. Louis County quickly senses the progress of the learning activity regardless of whether school is in session or not. There is a feeling of work-study-accomplishment. In the social studies classroom, for example, he sees the usual chalkboard area, map rails, project cabinets, and work surfaces. But in addition there are project display walls which extend from floor to ceiling, usually along two sides of the classroom. On one such wall there may be a "place" and "event" map, 30 feet by 8 feet, of the entire Orient. He sees that the students have been working on it for some time, for some portions are still only roughed in along grid lines, whereas others are completed, with place names, dates, and notations of important events—visible evidence of the pupils' increasing understanding of history and geography. The project display walls provide a progressive record of what the class has already learned and what it must still learn. All the work on these walls is removed at the end of each term; if necessary, the walls are repainted for each new class.

Consider the pupil as he goes from classroom to classroom. Early in the morning he may have a class in arithmetic. Next he goes to industrial arts and from there to a language class. At the end of the day he reports to the history room.

That student has many adjustments to make. His identification with arithmetic must be suddenly set aside as he leaves that class, and as he approaches the next class all his energies must quickly be concentrated on picking up the threads of another subject. It is desirable, therefore, that as many visible evidences of a given study situation as possible be reflected in the displays on walls, display boards, and bulletin boards in every classroom he enters.

DEFINITION OF THE STUDY DISPLAY

The study display includes a variety of devices: two- and three-dimensional objects, and collections of graphics, pictures, and news clippings displayed on bulletin, felt, or magnetic boards; mobiles; and floor exhibits that present a classroom's current learning plans or accomplishments in visualized form. The kind and amount of display space needed depends on the creative ideas of teacher and pupils. As was said earlier, the entire classroom holds possibilities. Today, "teachers know that walls can teach, and they constantly plead for more chalkboard and tackboard. . . . We hope the architect will use the walls in many ways."[1]

FUNCTION OF THE STUDY DISPLAY

Too often the bulletin board or tackboard is used for no other purpose than to display announcements of forthcoming events, safety regulations, and other general information. Although this use is necessary, it must not be confused with the true teaching function of the study display.

The hall display case which frequently exhibits outstanding work done in health education, arithmetic, art, or the social studies is an essential part of the school's display work; but it should not be thought of as a functioning teaching display area.

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[1] *A Living School,* Report of the Planning Group for Programming an American International School in New Delhi, India, The Ford Foundation, 1960.

Although all these types of display—the administrator's display, the observation of special events, and exhibits of individual class accomplishment—are an integral part of the school, the following discussion will concern study display techniques that are useful in the improvement of day-to-day classroom teaching situations. The goal will be to show that the *teaching study display* can become a valuable and integral part of learning activities in the classroom.

We shall see that the study display is an instructional opportunity which calls upon teacher and pupil alike for creative planning and ingenuity. Since the study display is a means of relating appropriate graphic materials to the subject currently being studied, it provides an opportunity to bring together useful pictures, graphs, comics, posters, charts, symbols, and related illustrative materials to supplement the current study activity.

PROVIDING ADEQUATE SPACE FOR THE STUDY DISPLAY

The usual classroom does not always have adequate space available for the study display. Too often doors, windows, ventilators, and storage cabinets and cases are located so they interfere with what could be a useful display

area. As a result, display surfaces are located high above chalkboards, in dark corners, or in poorly lighted spaces between windows.

Nevertheless, large amounts of wall surface can be made available for display purposes by careful planning. The new vision-strip windows (Fig. 6.2) make available additional wall space for display purposes. Classrooms so equipped achieve visual identification with the outdoors by means of 40-inch windows which stretch across an entire wall; cabinets, bookcases, and storage shelves are placed in the area of low visibility below the windows, thus freeing three complete walls for chalkboard, tackboard and display use.

The earlier belief that the age of the learners in a classroom solely determined the location of the display areas no longer holds true. Today, displays are planned for almost any part of the room where the visibility is good; even the topmost parts of the walls may be useful. In other words, the horizontal and vertical dimensions of a study display area are limited only by the imagination of the teacher and pupils in visualizing ideas and concepts which develop from the work-study pursuits of the class. Unless walls are utilized in teaching and learning, they constitute a functional waste in the modern classroom.

New building materials and design encourage such display installations as display walls and space dividers.

Because of the need to keep classroom construction costs low, brick, poured concrete, or cement or concrete blocks are often used for the walls.

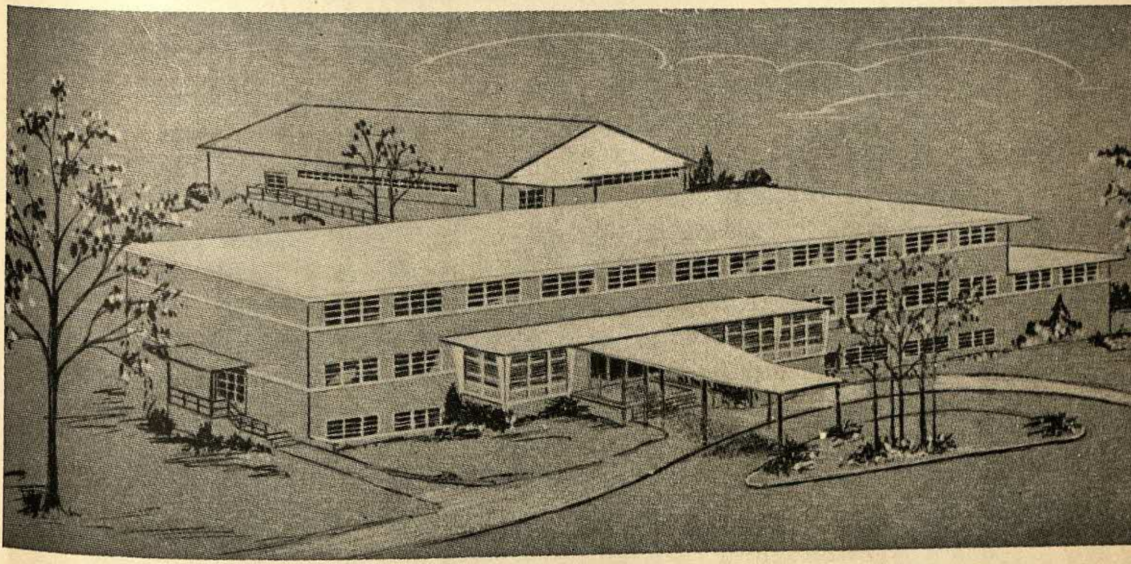


Fig. 6.2. *Left:* a display wall in a vision-strip classroom in the building shown above. Placing bookshelves, storage cabinets, and shelves for equipment against the wall below the vision-strip windows makes three additional walls available for display purposes.

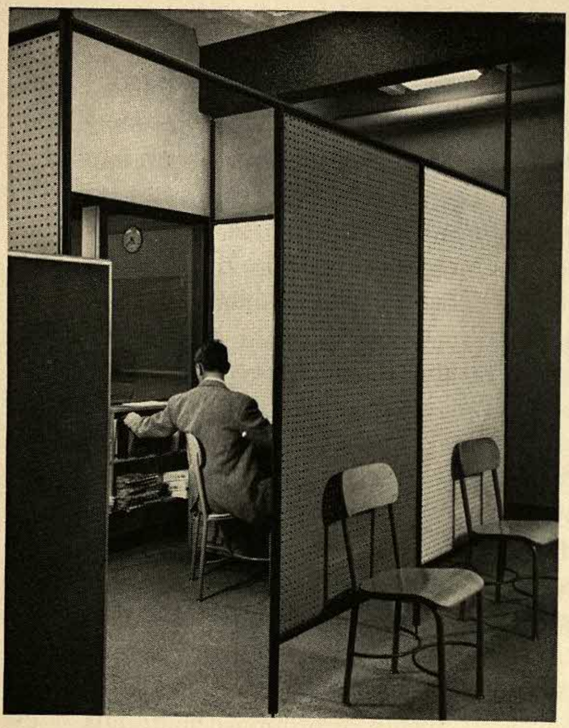


Fig. 6.3. Wall segments and space dividers provide additional display surfaces in the classroom.

Such walls can be economically prepared for display use by means of coverings made of wall fabric, corkboard, fiberboard, plywood, soft presswood, or Masonite pegboard. As a matter of fact, it is almost as cheap to use these coverings as it is to give the porous surfaces enough coats of paint to cover them completely.

In classrooms where television viewing is scheduled, where team teaching is in progress, or where work areas are separated from study or discussion areas, movable space dividers or wall segments may be so constructed that they can be used as display surfaces. Space dividers (Fig. 6.3) may be made of perforated Masonite, or of either cork-surfaced or cloth-covered plywood.

In older schools, where additional display space is needed, one or more of the following suggestions may be helpful:

1. Unused wall or chalkboard areas can be hung with coarse, loosely woven cloth or strong paper suspended from a light but strong wire stretched along the top of the chalkboard. Cloth gives a good surface to "pin to." The heavy paper can be used as the "art paper" itself, the children drawing directly on it with crayon or pastel chalk. These temporary display surfaces can be easily restored to their original uses.
2. Small areas up to 4 by 6 feet can be converted for use as display areas by attaching to them soft wood, or a plywood veneer, which has been covered with an inexpensive, loosely woven, neutral-covered material. Cloth can be glued to the veneer; or if only a temporary surface is to be provided, the cloth can be stretched over the edges of the veneer and tacked lightly to the back with small tacks.
3. Cloth-covered pine-strip "grids" can be used when large areas are required for display purposes. The entire back wall of the classroom can be inexpensively converted in this way. White pine or some other strong

but light softwood in 2″ by ½″ strips about 4 feet in length is suitable. Arrange these strips in a grid which is spaced at intervals of 12 inches.

Make the grid firm by driving two or three brads or tacks into the wood at each intersection. These grids can be covered with light cloth to improve their appearance. They can be moved easily from place to place, leaned against the wall, set upright in the chalk rail of the chalkboard, tacked to wooden moldings, or hung from a map rail or from hooks suspended from moldings.

Art materials, handwriting specimens, project pictures, and other study materials can be attached to this grid by thumbtacks or common pins.

PUPIL-TEACHER RESPONSIBILITY FOR STUDY DISPLAYS

Effective study displays are usually the result of pupil-teacher planning and participation. In the beginning, the teacher almost always carries the major responsibility; he demonstrates how study displays are directly identified with classroom learning, including planning, discovery, culmination, and evaluation. As the process "catches on," however, the students gradually assume increasing responsibility. They plan, locate appropriate materials, arrange them into meaningful displays, and finally evaluate the outcome. The pupil who has imaginative curiosity is usually the one who finds magazine, newspaper, or other source information about the subject being studied. As he manifests his own aptitude and interest, he finds his place in the activities which produce effective study displays.

The student who is artistically inclined, who is interested in color, design, and form, should be an effective member of the bulletin board planning committee. This group can mount pictures, prepare original diagrams, etc. Pupil ability and interest may give clues to participation on other committees. The teacher who knows the interests and capacities of individual pupils and correlates these with the opportunities presented by study display work is creating opportunities for better expressions of pupil initiative.

A group of teachers in Wilmette, Illinois, devised a method of maintaining an accumulating file of study pictures. Each teacher was given a metal file in which study materials were stored under appropriate subject and unit headings. This file provided ideas for bulletin board arrangements. If key materials are put on the display board and a portion of it is left blank, few pupils will fail to respond to the challenge the blank space offers. After the teacher talks about completing the display, the children will hunt everywhere for interesting things to add to it.

Finally, the problem of evaluation, the true worth of the display, must be faced by both teacher and pupils. Has the display contributed to the learning goals sought by the group? Was it worth the effort involved in making it? Unless these questions are answered affirmatively, the activity should be analyzed and improved procedures sought.

PLANNING AND ARRANGING STUDY DISPLAYS

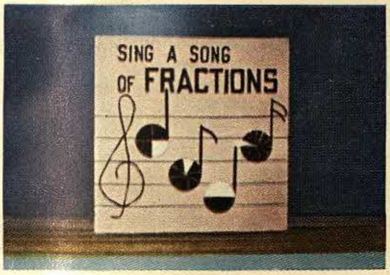
In visiting other classrooms, how often have you exclaimed, "What a clever study display!" This apparent "cleverness" is usually, if not always, the result of careful planning and hard work.

Successful preliminary planning requires increased familiarity with the tasks involved in creating displays. The teacher ordinarily takes the initiative in this planning; but the pupils, working individually or in committees, soon became adept in developing their own plans. Although no one wants to follow the same plans, there are certain basic principles of arranging displays. Each teacher-pupil group should consider them, but apply them as their particular needs indicate.

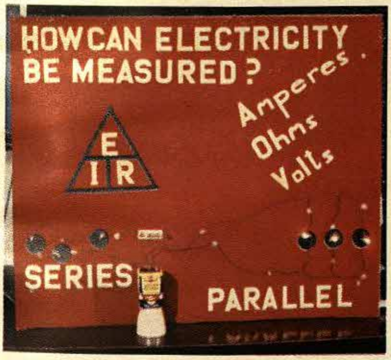
1. Discuss and understand the purpose of the display. State the purpose. Give the display a name, a headline. This heading should state the central idea. Be dramatic. Ask a question, pose a problem, make a direct claim or statement.
2. Visualize the display. If the subject can be described graphically, the display is the way to do it. The pictures, graphs, diagrams, or models used in it should all help to bring about further understanding of the central purpose of the display.
3. Plan the layout and content of the display. Use sketches or small paper cutouts that can be moved around the desk top to test ideas and save time in discovering which arrangement is the most attractive.
4. Determine what materials and supplies you need. Supplies for study displays should be easily available to both teacher and pupils. The more usual supplies include artcraft paper; large sheets of heavy paper for backgrounds and for paper sculpture; pastel chalk, wax crayons, and showcard colors; lettering stencils and pens; three-dimensional cardboard, plastic, or ceramic letters with which words and phrases can be

Opposite page: Here are seven study displays. Examine them carefully. To what extent do they observe the criteria of effective arrangement and use of color listed on pages 157 ff.? In which of these displays is color used to demand attention, to communicate factual information truthfully, or as an aesthetic factor? The peepshow here is a paper-covered display case that holds the exhibits. What advantages does this device offer?

THAILAND
ประเทศไทย


SING A SONG
OF FRACTIONS

TRAIN FOR GOOD HEALTH


HOW CAN ELECTRICITY
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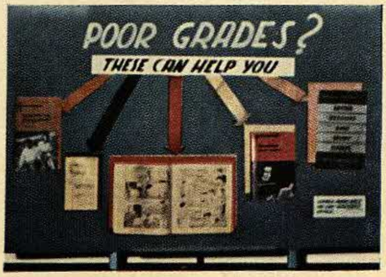

POOR GRADES?
THESE CAN HELP YOU

PEEP SHOW

orange
green
red
yellow
blue

formed; and masking tape. Mounting must also be considered. Wire, tacks, and pins may be used. Light objects and pictures can be mounted with loops of adhesive tape, sticky side out. For heavier objects, a dry glue known as Bulletin Board Styx is useful. (See the Source Lists, pages 477 ff., for display materials. See also the films listed on pages 485 f.)

The Art Department may be a source of materials that are not available in the classroom, as may also the window trimmer in a nearby department store. He usually has binsful of paper, fabrics, and display odds and ends that have served their original purpose and which, with slight adjustments, may be valuable for a study display.

5. Arrange the parts of the display dramatically and attractively. Take a cue from modern magazine and newspaper layout. Use attractive groupings. Have plenty of open space. Avoid a "rank and file" mounting of pictures or objects.
6. Use color when color is clearly needed to bring out the truth of what the study display is to communicate. Also use color when it will attract the learner's attention and interest in the content of the study display.

   The use of color in study display situations has at least the three following purposes:

   a. To dramatize or focus attention on key items or relationships. Intense colors virtually demand the attention of the viewer. Study displays involving rules, directions, steps in a process, time lines or important dates in history, etc., will profit from the judicious attention-demanding use of colors which help classify or differentiate.
   b. To portray visualized information with truthfulness. Scenes, costumes, persons, and geography and science objects which have color in real life demand the use of color when presented in a study display. Thus a study display designed to portray wild life effectively must of necessity be shown in its natural and authentic colors. Similarly, displays involving architecture, costumes, and geographical settings should be shown in natural color if the full truth about them is to be communicated to the learner.
   c. To heighten interest. Study displays are more likely to attract attention when color is used as part of the design, that is, when pleasing combinations of colors (see color wheel facing page 217) are used in a decorative way for backgrounds, for frames for the graphics in the display, etc. Displays set off against warm complementary colors usually appeal to the learner's aesthetic sense and help interest him in further study of the display.

   Color wisely used is an important consideration in the content and arrangement of effective study displays. Good judgment and common

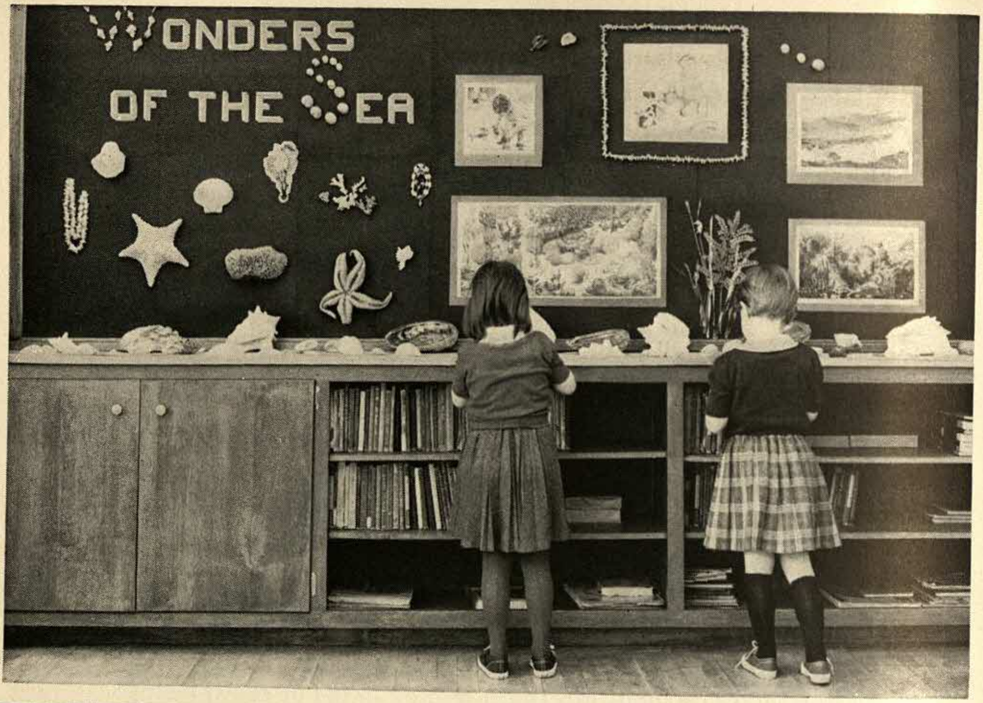


Fig. 6.4. This display was begun by the teacher and added to as the pupils assumed responsibility for finding and bringing to class appropriate pictures and objects for it. Interest is self-evident.

sense are the teacher's best qualifications for using color intelligently in creating effective study displays. (See plate facing page 156.)

STUDY DISPLAYS THAT TEACH

Study designs that teach fall logically into three general categories: those which motivate, the work type, and those which represent the culminative efforts of the class group.

DISPLAYS WHICH MOTIVATE

In creating a motivational display, the teacher often finds it necessary to locate materials and to plan and arrange it himself. This is to be expected, since this type of display serves to stimulate interest in new fields of study and, later, pupil initiative in creating displays. Although motivational displays, like all displays, involve a great amount of work, this should not deter the teacher as far as their continued use during the school year is concerned.

The teacher may secure display materials from his own classroom files of graphics, charts, and pictures which relate to key subjects, or from the picture-graphics files in the library. If his goal is to present a ready-made or complete display to arouse interest at the beginning of the year, he may reassemble a particularly effective display that was used the year before.

At the beginning of the semester, a high-school science teacher arranged, in a display case in the hall outside the classroom, exciting and interesting pictures, objects, and graphics which represented descriptive and quickly recognizable high points of the several units of work to be covered in the course. Each unit of the display could be seen only by looking through peepholes in the papered-over glass front of the display case. (See color plate facing page 156.)

Realizing that her pupils had little opportunity to collect such materials as she could during her summer travels, an elementary teacher gathered, over a period of several years, interesting materials to be used in the first of a series of motivational displays on life in the sea, on the land, and in the air. The display shown in Fig. 6.4 was begun with her collection of pictures and objects. As soon as the first display was arranged, the children became interested in bringing more things from home, and also in the further study of the subject which stemmed from the ideas conveyed to them by the display.

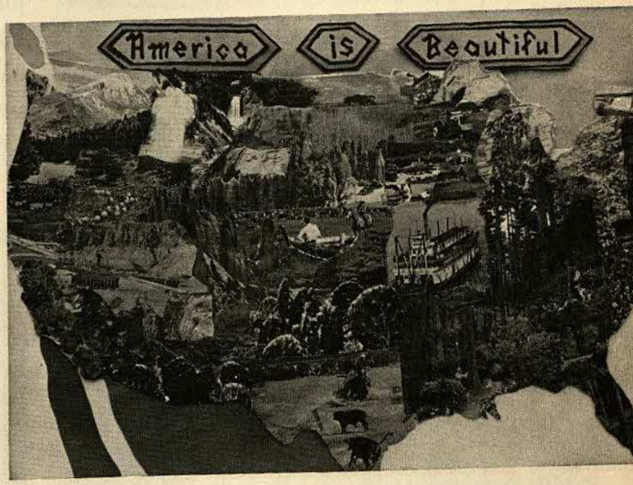
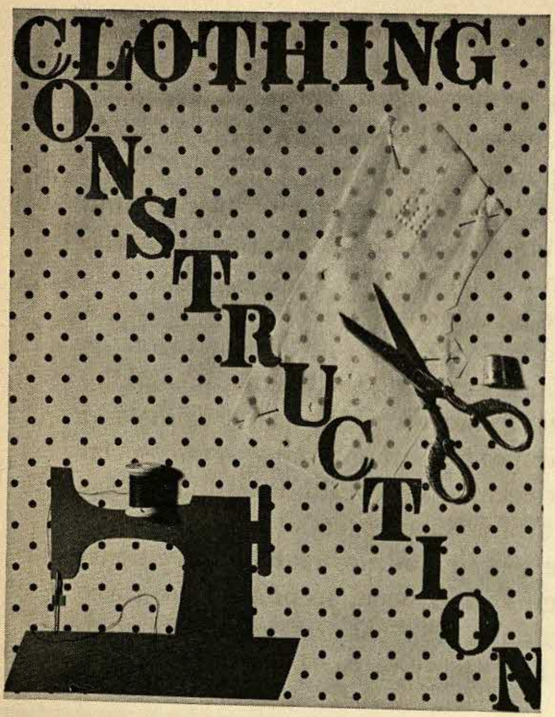
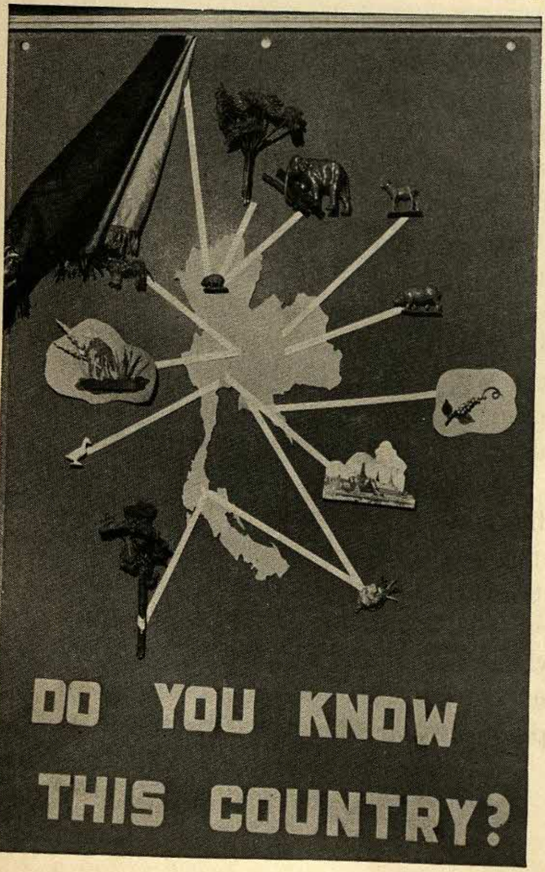


Fig. 6.5. A collage. What adaptations can you envision for its use in your classroom?

A collage, a combination of appropriate cutout and fit-together pictures, is of great interest to pupils. "America Is Beautiful," a collage arranged in the pattern of the United States, is shown in Fig. 6.5. It was displayed at the beginning of the semester as an overview of the core area of study —places, activities, and people of the United States. In their free time, groups of pupils studied the details of this collage with great interest. Collages offer opportunities for motivational study in science, world geography, history, music, language arts—virtually every subject for which pictures and other graphic materials are available.

Several days before beginning a junior-high-school unit on the petroleum industry, a teacher put up on the display board several pamphlets and actual three-dimensional sample bottles of petroleum products. He asked the pupils: "Will you be on the alert for more interesting material, pictures, etc., about petroleum? If you find anything interesting, will you bring it in?"





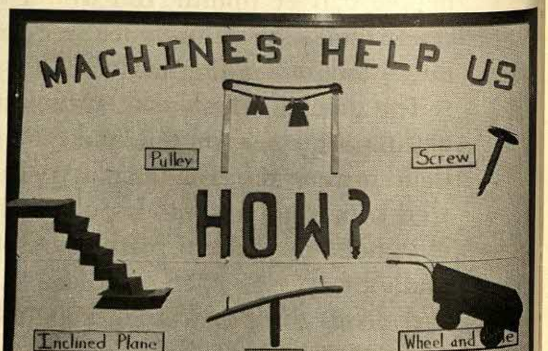


Fig. 6.6. These three motivational displays illustrate how questions and well-balanced arrangements of pertinent materials can arouse the curiosity of the learner so that he will find things out for himself.

The students were interested—so much so that before the unit began, news clippings, additional specimens, and pictures of petroleum products and the petroleum industry were brought in to supplement the core display.

A high-school mathematics teacher periodically posted a single but unusual problem which was displayed diagrammatically. These problems never failed to attract a knot of curious students, who would be pondering such a question as: "Which of the one-pound candy boxes would require the shortest length of ribbon to tie it once around each side?" In this case, three beribboned boxes of varying size but identical volume were attached to the board below the question.

A science teacher posted a vocabulary list each week. Beside this list he put cutout magazine illustrations so that students could match words and pictures—a combined picture-dictionary, so to speak. A primary-grade social studies teacher mounted photographs relating to wildlife in far-off places, thus capitalizing on an opportunity to arouse the curiosity of young learners.

It is natural to respond to a challenge. In the case of the motivational study display, however, the challenge should be appropriate. The three motivational study displays pictured in Fig. 6.6 illustrate appropriate challenges which are within the interest and ability of the learners for whom they were designed.

The display, "Do you know this country?" invites the learner as well as you, the reader, to apply the readiness experience you already have to the problem of identifying the "silhouette" country and recognizing where the three-dimensional objects occur in the combination shown. It says to all who see it: Do you know this country where rubber trees and sprigs of white pepper can be found? You would walk closer to look at these objects and "feel" their texture. As a learner you might leave this display a little more interested in reading and talking about Thailand.

The display which asks, "Machines help us—How?" is a natural way of getting young science learners to think about a new subject in terms of their present-day readiness experiences with simple machines. The child who knows about clothes pulleys, hammers, and wagons is ready for well-channeled curiosity to lead him to study of the simple machines represented in this display.

A civics teacher who anticipated difficulty in capturing the imagination of her ninth-grade class for a thoroughgoing study of the United Nations sought the help of interested students. They arranged a display that was studded with questions about the United Nations and that immediately caught the interest of the class as a whole.

Motivational displays which announce coming events and activities are more routine. Nevertheless, if this type of display is given the same care as

Fig. 6.7. A committee chairman shows a visual plan for a display. Planning, reporting, and cooperative activity like this is the basis of creating work-type displays.

far as planning, arrangement, and content are concerned, its effectiveness will be increased.

THE WORK-TYPE DISPLAY

The work-type display is an imaginative, visualized, systematic report of the progress made by the entire class or by committees as they go on to the various stages of study and then organize the key generalizations or conclusions they reach. Usually these can be visualized, either by finding suitable pictures, charts, or objects, or by making drawings and pictures of what they have learned. The work-type display is thus closely allied with general study progress.

This type of display is particularly effective when it is undertaken initially by the pupils and is continued as the product of their own creative and developmental thinking, planning, and doing. This may involve trial and error, and the formulation of procedures, questions for study, and techniques for continuing the search for information. The work may be done by individual pupils, or by committees which report their ideas to the class (Fig. 6.7).

The widely known experience chart and mural display continues to reveal the extent to which the day-to-day work-study progress of primary-grade pupils fulfills goals in reading, vocabulary, concept understanding, creative art, and language arts. Work-type study displays can become evaluation experiences. When children are able to create an accurate and understandable mural about turtles and their habitat, when they write or dictate an experience chart, when they discuss their learning outcomes, the display chart thus produced is a true measure of accomplishment. It is hard to describe the point at which a work-study display becomes a culminative display, nor is the distinction worth much attention. It is important, however, to describe carefully the role both may have in stimulating the processes of useful learning.

At the intermediate level, displays built around nouns and action words offer incentive and pride of achievement to the learner. The work-type display is most effective when it gives evidence of ideas and information which are closely related to or actually grow out of the subject being studied.

An area of classroom experience which is inevitably of concern to the teacher has to do with possible techniques for the motivation and improvement of drill situations. There is a continuing need for drill, particularly in arithmetic and mathematics, language arts, the social studies, and history. The work-type display has an important part to play in dramatizing and heightening interest in drill situations.

Fig. 6.8 demonstrates how drill information in language arts was made the subject of an attractive and interesting display. "We need to know" rules were dramatized. The rules were put on cards which were changed at intervals of a day or two; the class discussion of them determined how often they were changed. The cutout stick figures were changed or not, depending on whether they were appropriate to the new rules and words. This type of display permits related drill areas —for example, vowel sounds which influence pronunciation—to be presented in an attention-arresting matter, as in the two vowel sound drills shown in Fig. 6.8.

Similarly, arithmetic rules, geometry theorems, and other drill materials can be made the subject of study displays. At first such displays have to be arranged by the

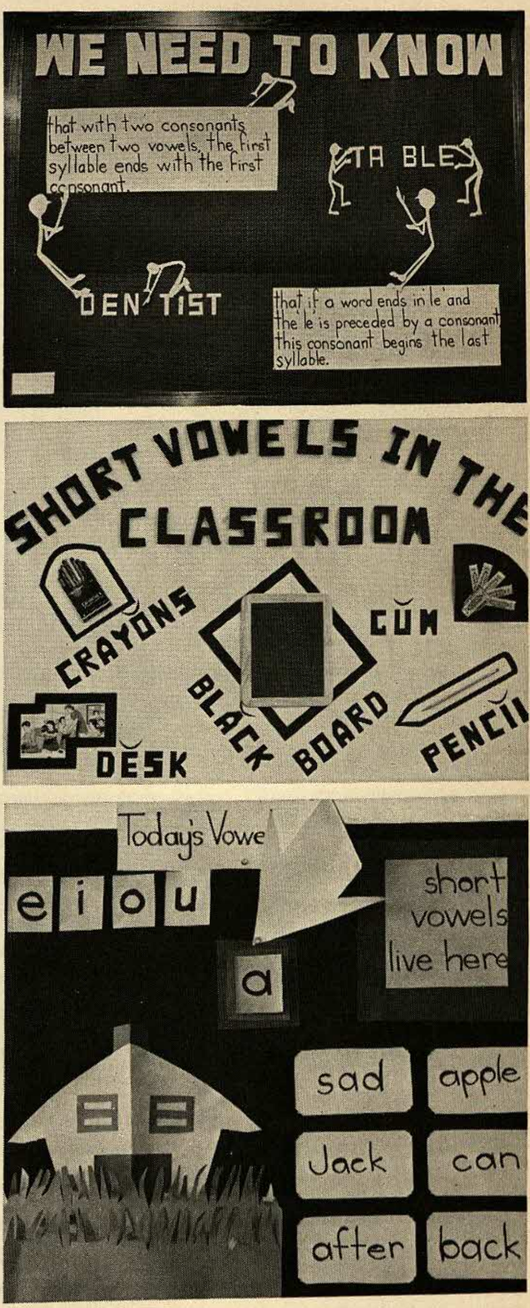

WE NEED TO KNOW
that with two consonants between two vowels, the first syllable ends with the first consonant.
TA BLE
DEN TIST
that if a word ends in le and the le is preceded by a consonant this consonant begins the last syllable.
SHORT VOWELS IN THE CLASSROOM
CRAYONS
GŬM
BLACK BOARD
DĔSK
PENCIL
Todays Vowe
e i o u
a
short vowels live here
sad
apple
Jack
can
after
back

Fig. 6.8. The content of these work-type displays can be changed from day to day. What are your ideas for similar displays in arithmetic, science, mathematics, or foreign languages?

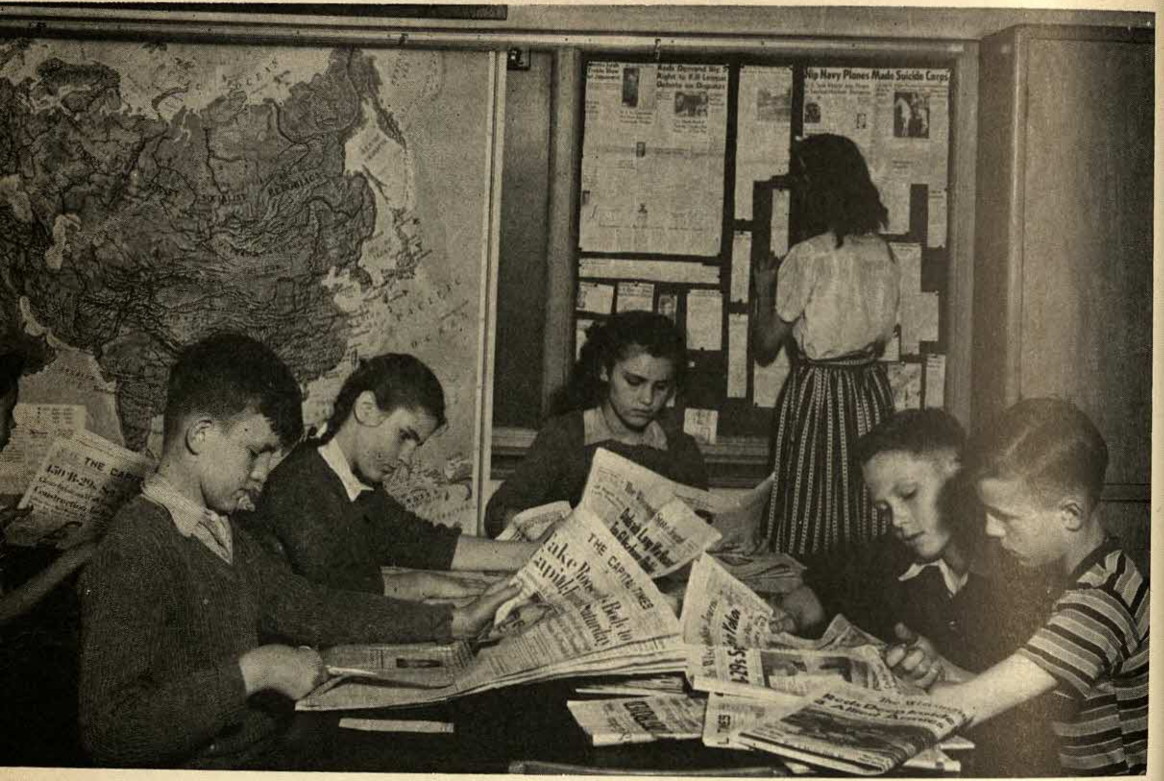


Fig. 6.9.

teacher. As soon as possible, however, interested and able pupils should assume responsibility for knowing the rules and then arranging displays that will explain them to their classmates.

In language arts situations, study materials such as newspapers, magazines, maps, charts, and wall displays supplement one another as the pupils seek to interpret the news in terms of geographical areas and social groups. In Fig. 6.9, junior-high-school pupils are collecting materials and doing simple background research work for the "data" around which a "newscast" on events of the day will be built.

When the work-type display is used to record class progress, the group's decision on the main problem to be studied may be prominently displayed on the board. As subproblems are developed in class discussion, they also are included. Evidence of the continuing search for information in books, periodicals, audiovisual materials, interviews, etc., can be systematically added.

The work-type display can be used whenever motivation can be developed —in any classroom situation, at any level, and in any subject. Display areas can be expanded, if necessary, by using another wall area temporarily. This type of display can become an integral, closely associated record of progress of the day-to-day work done in the modern classroom.

THE CULMINATIVE STUDY DISPLAY

A group of visiting teachers entered a science classroom. The results of eight weeks of work were exhibited on a display table that blended into a flat backdrop of blue in which nearby planets were mounted in three-dimensional perspective, as if suspended at various distances in space. On the surface of the table was a replica of all the parts of a space vehicle.

"Not only was this fun for all of us," a student commented, "but we had to find out the answers to dozens of questions before we could finish it."

A social studies teacher described a display which showed the work done by six pupil committees on the geography, history, industry, etc., of the state of Wisconsin.

"Each pupil chose the committee on which he wanted to work. After reading resource material and viewing filmstrips and films, each committee reported its key findings in the form of a series of overlying map displays. Each overlay recorded the information that the committee considered important." The final cooperative display of the six committees is shown in Fig. 6.10.

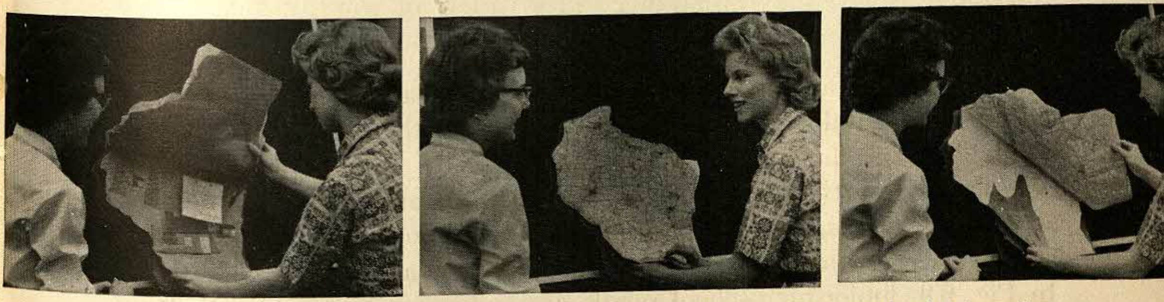


Fig. 6.10. This display packet of Wisconsin-shaped overlays presents visualized information which is the culmination of committee work; the glaciation of the land surface, the state's history, industry, people, recreation, etc., follow in sequence. Adaptations of this display can be used wherever sequential study and explanation are important.

The culminative display "pulls together" the work accomplished over a period of days or weeks; it summarizes the end products of a unit of work. The degree to which all the pupils participate depends on individual ability. However, unless everyone contributes in some degree, the display activity cannot be carried to its highest level of development. A good classroom study display represents the entire group's thinking, planning, and

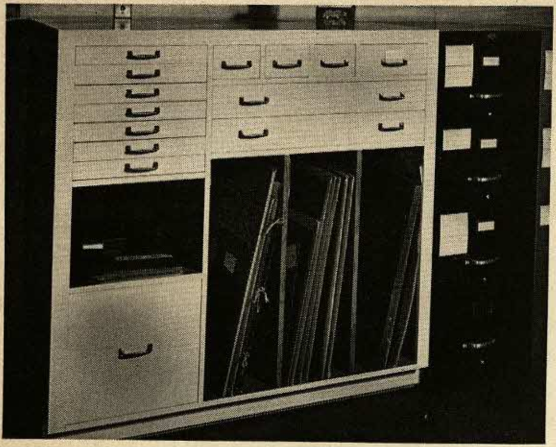


Fig. 6.11. Storage facilities should be part of the classroom furniture.

developing. Because it enables the class as a whole, as well as the individual pupils, to see the end results of what they have done, the culminative display serves as a summarizing, evaluating, or concluding record of a classroom activity.

What should be done with displays when they are completed? Most should be destroyed, since the learning value of any display stems from the activity in its entirety. In some cases, however, an exceptionally good display may be kept as a challenge to other classes. It should be stored along with display art materials. Suitable storage facilities like those shown in Fig. 6.11 should be provided in the classroom.

SPECIALIZED STUDY DISPLAY DEVICES

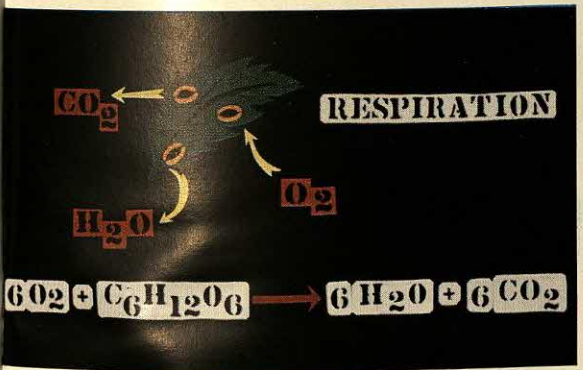
Teaching displays may be arranged in a variety of ways on a variety of surfaces. Traditional means for classroom display include tackboards, presswood bulletin boards, panels mounted above the chalkboard—all fixed or built-in areas for display. The teacher may devise temporary display surfaces (see page 154). There are also adhering boards such as the hook-and-loop board, the feltboard, and the magnetic board, among others.

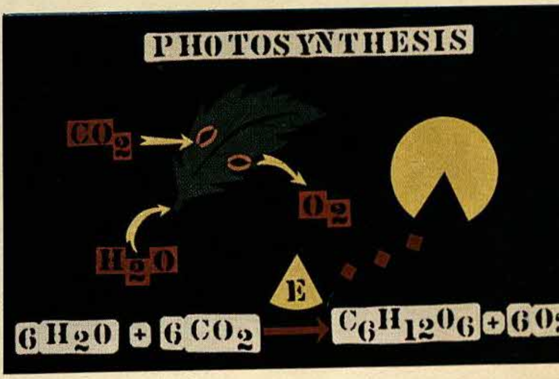
THE HOOK-AND-LOOP BOARD

The hook-and-loop board enables relatively heavy three-dimensional objects, as well as pictures and diagrams, to be displayed. The surface of the board consists of a great many small but very strong nylon loops. An adhesive-backed patch, on which thousands of tiny hooks are interwoven per square inch, is affixed to the object to be displayed, and the object is then pressed gently against the hooked surface. The supporting strength of this device is remarkable, as is also the ease of removing the object from the

Opposite page: This demonstration of the water cycle and the more complex transpiration-respiration concept illustrates the value of the feltboard in situations where color symbols must be quickly rearranged during question and discussion in the classroom. A hook-and-loop board, a new device for displaying heavier objects, was used for the hydrogen-helium display.

WATER CYCLE


CO_2
RESPIRATION
O_2
H_2O
$6O_2 + C_6H_{12}O_6 \rightarrow 6H_2O + 6CO_2$


PHOTOSYNTHESIS
CO_2
O_2
H_2O
E
$6H_2O + 6CO_2 \rightarrow C_6H_{12}O_6 + 6O$

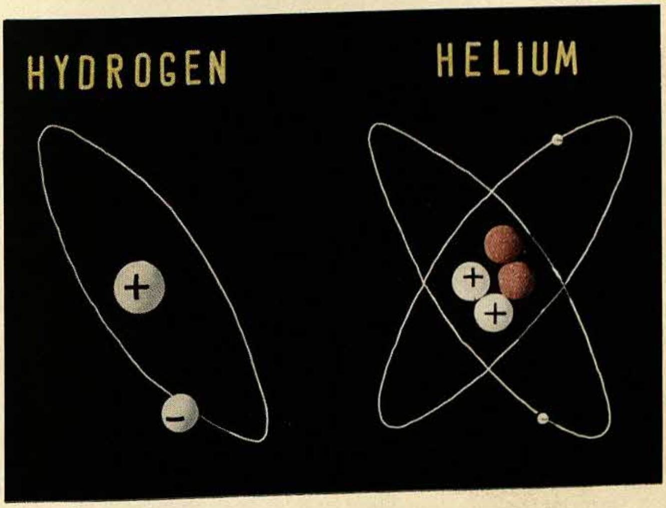
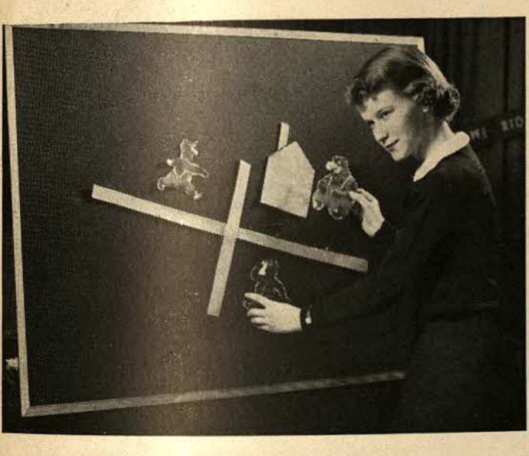
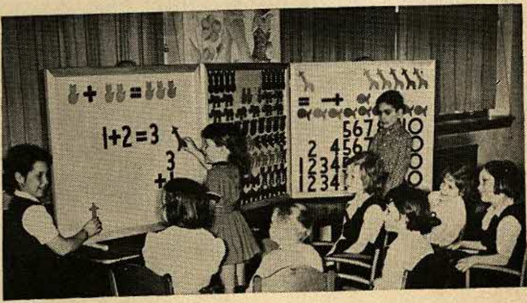

HYDROGEN
HELIUM
+
−
+
+

Fig. 6.12. Adhering boards are useful in visualized demonstrations which call for easy arranging and rearranging.





board. (See color plate facing page 156.) The many possibilities of this device soon become apparent to the teacher.

THE FELTBOARD

The fact that hair, wool, and cotton felt or flannel will adhere to like surfaces has long been used in arranging so-called feltboard study displays. Today the feltboard, either produced commercially or home-made, affords many opportunities for the enrichment of classroom teaching techniques.

"Cotton outing flannel" or wool felt is usually used for feltboards. This is stretched and then fastened with glue or thumbtacks to a flat surface—plywood, Masonite, or heavy cardboard. Or the cloth can be made into a sort of pillowcase to cover both sides of the flat surface.

Paper cutouts, diagrams, and illustrations from magazines or newspapers, symbols cut from craft paper that is relatively lightweight and somewhat textured, and ready-made felt figures all adhere to the surface of the feltboard. The various elements can be moved about easily and quickly during discussion and developmental explanations (Fig. 6.12).

The water cycle display shown in the plate facing page 166 emphasizes the effectiveness of color. The symbols were cut from construction paper and the foliage was made of heavier paper. Small pieces of light-weight sandpaper were attached to the back of the various elements to improve adhesiveness. This feltboard display demonstrates the value of being able to move the various elements around as the discussion begins with understanding the water cycle and proceeds to transpiration, respiration, and photosynthesis.

Combining figures cut out of an inexpensive children's magazine or book with cutouts of craft paper provide the materials for a creative story hour or for a story demonstration on school playgrounds and street safety.

A feltboard is of value to the chemistry teacher in explaining molecular structure, the meaning of valence, etc. The physical education teacher and the language arts and foreign-language teachers find it helpful for study and drill activities and marching formations, for explanations of relationships between parts of a sentence, and for vocabulary drill. Regardless of the age level of the pupils, the feltboard can be the means of visualizing concepts which call for sequential, visual change during discussion, questions, and demonstration. (See Source Lists, page 477, for various kinds of display devices.)

EVALUATING THE STUDY DISPLAY

Study displays are the outgrowth of the need for visualizing the initial steps, progress, and final achievement in classroom activities. Because of their importance in teaching, the creation of displays is likely to be time-consuming. In order to make sure that the time spent for this purpose is commensurate with teaching outcomes, both pupils and teacher should critically evaluate the study display in terms of its effectiveness as an experience in learning.

Study displays must be useful in the teaching process. Regardless of the care and effort that have gone into them, most of them should be dismantled once their usefulness is past. Display techniques should be constantly under scrutiny, and opportunities for improvement continuously sought. Lettering, wording, clever arrangement should all be considered when the study display is evaluated.

The following evaluation scale is suggested as a measuring instrument which can be used by teacher and pupil in answering the question, "Has our classroom study display been effective in helping us become interested and effective in doing a given unit of work?

Display Content

1. Did the information on our display help us in our study of the subject we were pursuing? Yes .... No ....
2. Did our display bring us information beyond what we could have got through more accessible, more easily available channels? Yes .... No ....

3. Was our display planned and executed by all of us to the maximum degree possible? Yes .... No ....
4. Were all the pupils encouraged to help in the creation of the display, each in terms of his own interest and ability to contribute? Yes .... No ....

Mechanics

1. Is our classroom equipped with modern display devices? Yes .... No ....
2. Were attractive headings, captions, phrases, etc., used to identify display objects and illustrations? Yes .... No ....
3. Was the display artistically balanced? Yes ...... No ....
4. Was it uncluttered? Yes .... No ......
5. Was it organized around a focal point of interest? Yes .... No ....
6. Were strings or tape, arrows, or other directional devices neatly and carefully placed? Yes .... No ....
7. If humor was possible, was the cartoon technique used? Yes .... No ....
8. When photography was possible, was it used? Yes .... No ....

For the Teacher

1. Do I maintain a file of photographs and other valuable pupil-created material for future use in motivational displays? Yes .... No ....
2. Are the basic display materials—colored paper, tape, pins, mastic materials, etc.—readily available to my pupils? Yes .... No ....
3. Have I drawn a simple layout of a good display to be filed under the appropriate unit of work so that a year from now I can improve on it as my pupils and I discuss means for preparing display work? Yes .... No ....

SUMMARY

A study display is a device for the classroom display of graphic materials which are closely related to the interests and study responsibilities of learners.

Display surfaces may be commercially produced corkboard, softwood, pressboard, veneer, etc. Temporary surfaces may be improvised from wooden grids covered with cloth or coarse wrapping paper. To be effective, the display should provide a large expanse of working space.

More important is the use to which the display is put. It is best used as a surface on which pictures, specimens (flat and three-dimensional), examples of student work, and all other kinds of related graphic study materials may be shown in the classroom.

Graphic study materials which are interesting, descriptive, and clarifying and which supplement other information sources closely related to classroom activities can be arranged in one of the following ways:

1. The motivational study display, which asks questions, presents problems, exhibits pictures, photographs, or specimens of unusual objects, or otherwise presents situations which attract learners and arouse their curiosity.
2. The work-type study display, which records pupil planning and progress. This display offers wide opportunity for pupil initiative and responsibility. Its content may range from brief statements of plans to pictorial or other graphic evidence of progress in a unit of work or the solution of a problem.
3. The culminative study display, which presents a complete graphic record consisting of charts, explanations, photographs, pictures, models, and specimens. The visualized outcomes of a completed study problem or project may be organized in such a display.

Arranging pictures into artistic groups, mounting three-dimensional specimens or models skillfully, using clever attention-arresting headings and colors, etc.—all are part of creating an effective study display.

The study display should not be a teacher-dominated classroom project; rather it should be the outgrowth of pupil-teacher planning. It should reflect a maximum of pupil initiative and creative participation.

Suggested Activities

1. Arrange to view such how-to-do-it films as the following. Then try out the suggestions you got from the films.
   a. *Better Bulletin Boards,* Sound, Color, 11 min., Indiana University.
   b. *Bulletin Boards: An Effective Teaching Device,* Sound, Color, 11 min., Bailey.
   c. *Bulletin Boards for Effective Teaching,* Sound, Color, 10 min., Iowa State University.
   d. *The Feltboard in Teaching,* Sound, Color, 10 min., Wayne University.
   e. *Flannel Boards and How to Use Them,* Sound, Color, 15 min., Bailey.
   f. *Flannelgraph,* Sound, Color, 27 min., University of Minnesota.
   g. *Lettering Instructional Materials,* Sound, Color, 20 min., Indiana University.
   h. *Paper Sculpture,* Sound, Color, 6 min., International Film Bureau.
   i. *Passe Partout Framing,* Sound, B&W, 10 min., Indiana University.
   j. *Techniques of Paper Sculpture,* Sound, Color, 10 min., Allen-Moore.
   k. *Wet Mounting,* Sound, Color, 10 min., Indiana University.
2. Begin to accumulate a file of photographs, diagrams, illustrations, specimens, etc., which will be useful in creating motivational study displays for the subjects you teach or will teach.

3. Help pupils plan and make a study display. In terms of known pupil interests and abilities, help small groups of children define how they will locate materials for the display. Organize such committees as these (if they are appropriate):
    a. Specimen collectors.
    b. Picture locaters and mounters.
    c. Caption makers.
    d. Diagram drawers.
    e. Original artwork creators.
    f. Reading researchers and authenticators, etc.
4. Visit your colleagues' classrooms. Examine study displays and judge their effectiveness, using the evaluation form on pages 168–169. Sketch roughly those you feel are outstanding; give reasons for your judgment.
5. Offer to provide additional temporary display space in a classroom which needs it. Ask the manual arts teacher or the building custodian for light 2″ x ½″ lath, or assemble simple materials and construct a grid-type display board.
6. Plan and actually arrange a study display of the motivational, work, or cumulative type.

Bibliography

American School and University, Audio-visual section, American School Publishing Corp., Vol. 27, 1955–1956.

Bridges for Ideas: 1. *Tearsheets for Teaching;* 2. *Bulletin Boards for Teaching;* 3. *Feltboards for Teaching;* 4. *Lettering Techniques;* 9. *Educational Displays and Exhibits,* Visual Instruction Bureau, Univ. of Texas.

Caldwell, Lee E., "Alcove Workroom Developed in Three Patterns," *Nation's Schools,* September, 1958.

Caudill, William W., *Toward Better School Design,* F. W. Dodge Corp., 1954.

Caudill, William W., and Bellamy, Cleon C., *The Development of the Teaching Space Divider,* Research Report No. 1, American School Publishing Corp., 1954–1955.

Engelhardt, N. L., Engelhardt, N. L., Jr., and Leggett, Stanton, *Planning Elementary School Buildings,* F. W. Dodge Corp., 1953.

Koskey, Thomas A., *Baited Bulletin Boards,* Fearon, San Francisco, 1954.

A Living School, Report of the Planning Group for Programming an American International School in New Delhi, India, The Ford Foundation, 1960.

"Modern Schoolhouse Planning," *Architectural Forum,* February, 1956, p. 140.

Can you desc be a Swiss mountain
home? W ls are used?

CHAPTER 7

MAPS AND GLOBES

"HAVE YOU MADE YOUR VACATION PLANS?" asked the teacher of his fifth-grade class on a late spring day.

A flurry of hands shot up.

"I'm going to camp!" said one.

"We're driving to Yellowstone Park," volunteered another.

"My dad wants to go to the Lake of the Woods and fish, but I think we're going to the Gaspé Peninsula instead," said a third.

Out of the enthusiasm of anticipation a series of useful writing, reading, and storytelling activities quickly developed. Location of destinations and routes of travel brought into use a map of the state, another of the United States, and a number of road maps as the students reported on their families' vacation plans. . . .

In tracing the changes in the foreign policy of the United States over the past half century, a lecturer makes use of a series of map slides, one of which is a world map centered on the north pole. With this he shows this country's changed position with respect to the rest of the world that modern air transportation has brought about. . . .

As he plans his campaign for a new bond issue, the city superintendent of schools makes extensive use of census plot maps to show population trends in the community, what parts of it have had the most new babies during the past five years, and where needed new school buildings should be located. . . .

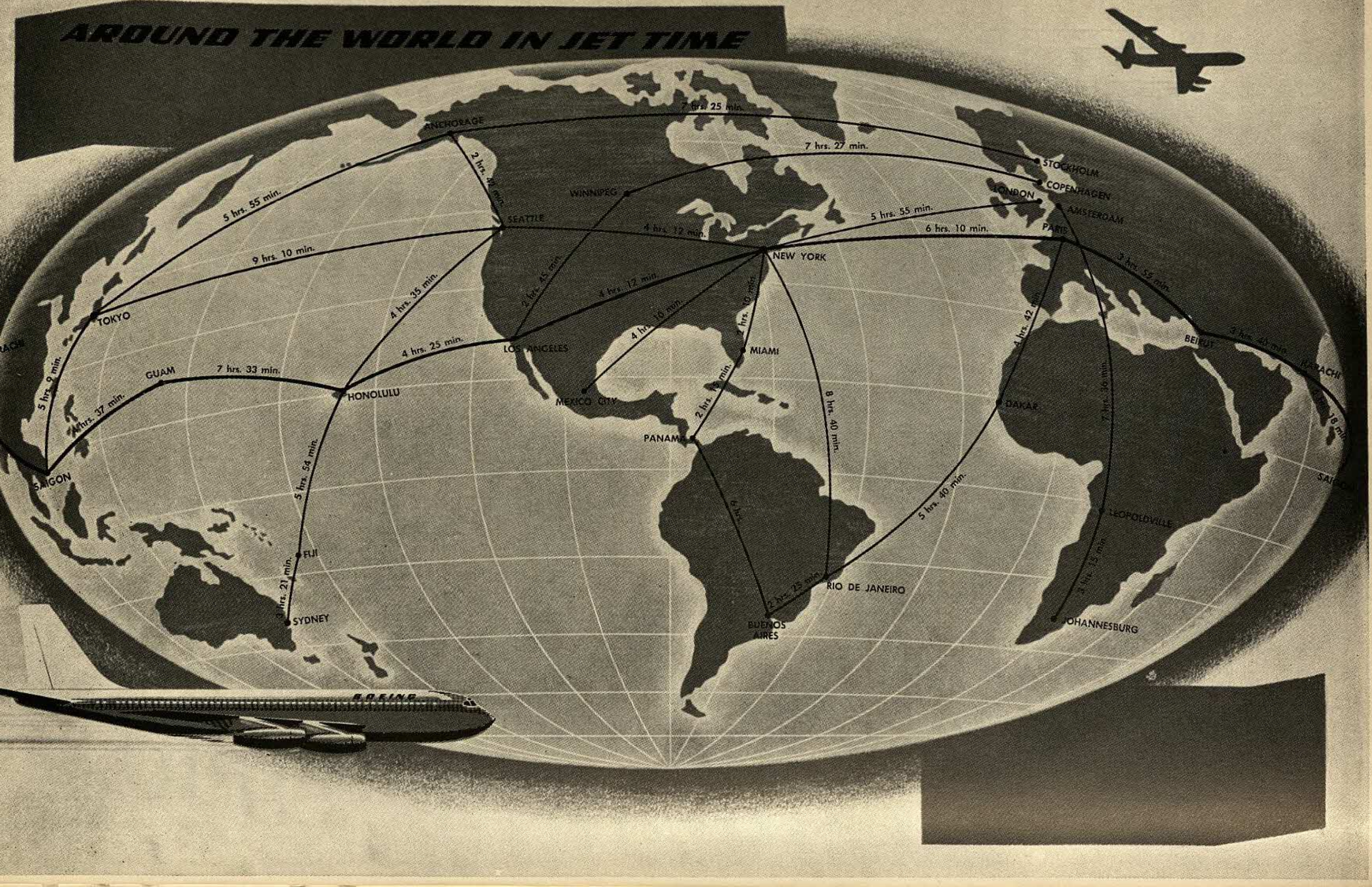
These are representative of the many daily uses of maps both in and out of school. Although we usually think first of maps as part of the study of geography in school, we come quickly to recognize how fundamental they are in a whole range of human activities. We use them not only in all forms of travel, but to interpret events and developments in the world around us. Maps help us to understand history and the rapid changes taking place in the world today—as well as to anticipate the changes which may lie ahead (Fig. 7.1). In fact, the rapidly developing role of maps in communication today reflects some of the changes which have taken place in the concept of geography itself.

GEOGRAPHY IN TRANSITION

The nature of geographical studies has changed. At an earlier stage of man's development, it was considered possible, in teaching geography, to trace a direct relationship between physical environment and where and how people lived. People settled near rivers, for example, so as to have easy access to transportation; or in regions of moderate but ample rainfall so that they could grow crops; or in level rather than mountainous terrain for the greater comfort of living. Such generalizations still have a degree of historical validity.

But today, desert areas have been reclaimed by irrigation; modern transportation has eliminated the need to live near rivers; and many mountain areas have become populous as man found satisfaction or wealth in their aesthetic, recreational, or mineral resources. As Preston James points out, "Modern geographers . . . insist on the principle that the significance to man of the features of the physical earth is a function of the attitudes, objectives, and technical abilities of man himself. . . . And further, geography examines the relationships not only between man and the physical or

AROUND THE WORLD IN JET TIME



biotic aspects of the environment, but also between man and the variety of cultural features resulting from economic, social and political processes.[1]

Today's need to understand the world and its peoples gives our schools what is perhaps their most vital function. This understanding must be based upon a sound knowledge of history and of geography. These subjects, in turn, require ability both to read and to interpret maps and globes.

The difference between these two levels of map use is much like the difference between reading words as a skill and reading books to explore the secrets of man's knowledge. To help his students learn through maps, the teacher must himself become adept in their interpretation and use.

CHARACTERISTICS OF GLOBES AND MAPS

Two general observations should be made with respect to the nature of globes and maps before we consider them individually in some detail. The first has to do with their degree of accuracy; the second with their abstract character.

DEGREE OF ACCURACY

Globes are spherical models of the earth. Since the earth itself is a sphere, globes are the most accurate maps we have of the world as a whole. A good globe has four properties or qualities: *area, distance, direction,* and *shape* of land and water regions on all parts of its surface are correct. It is in these respects that a globe is an accurate map of the earth's surface.

Maps are flat representations of the earth's surface. Because the earth's surface is spherical, a flat representation of any large portion of that surface involves certain difficulties. These are simply illustrated if you attempt to flatten out half a grapefruit shell or half of an old rubber ball. It can be done only by breaking or compressing the surface. In essence, this is a problem all mapmakers face. It becomes serious only with maps of very large areas such as a hemisphere or the world. Hence, one characteristic of flat maps is the presence of certain unavoidable inaccuracies. It is impossible, for example, for a cartographer to make a flat map of the world on which more than one (in rare cases, two) of the above four properties are accurately represented. Of these four, the most important one for general school purposes is *correct area.* This is so because when area is badly distorted on

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[1] Preston James (ed.), "New Viewpoints in Geography," *29th Yearbook,* National Council for the Social Studies, 1959, pp. 15–16.

Fig. 7.1. The jet age and some of its implications are suggested by this use of a map. The figures indicate approximate flying time by jet transport over great-circle routes between indicated points.

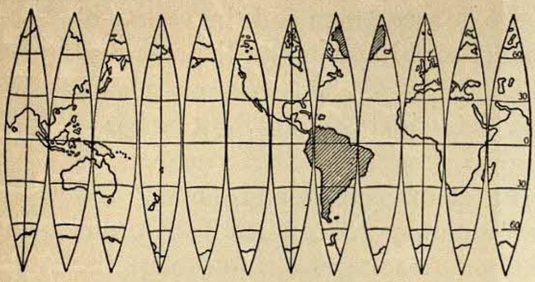


Fig. 7.2. When gores are removed from a globe and flattened, they look like this.

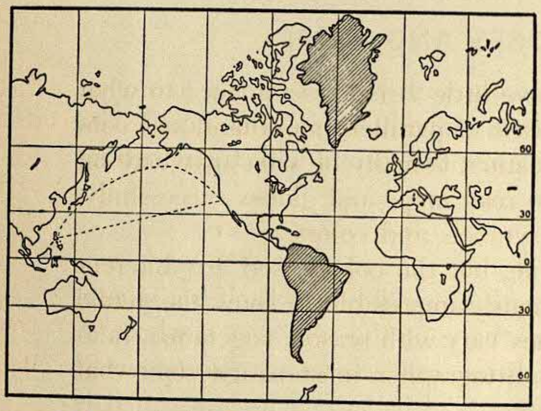


Fig. 7.3. Note how Greenland compares in size with South America on this Mercator projection. The curved dotted line is the great-circle route, the shortest surface distance from the Philippines to San Francisco.

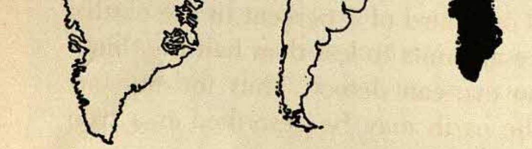


Fig. 7.4. Here is the Mercator projection of Greenland and South America. To the right, in correct scale, is Greenland. Comment on the accuracy of these representations.

a world map, the relative positions as well as the relative sizes of countries and continents are thrown off. Let us see how this occurs in the case of one familiar world map.

When the surface of a globe is divided along the meridians, the resulting sections are called "gores" (Fig. 7.2). On most flat maps the spaces between these gores are filled in or the gores are stretched in some manner so as to avoid gaps in the map surface. This produces area distortion.

The farther the distance north or south from the equator on a world map, the greater is the spread between the gores. Hence the farther north or south we go, the greater are the inaccuracies on a flat map which is centered on the equator. Thus the Mercator projection shown in Fig. 7.3 exaggerates considerably all areas above 50 degrees north latitude.

Because any straight line on it can be used as a compass line, the Mercator projection is very valuable for navigators; this is why it was made. But for school purposes it is very misleading with respect to the actual size of land and water areas. For example, Greenland appears to be larger than South America (Figs. 7.3 and 7.4).

We will discuss this problem in more detail in relation to map selection. Meantime let us note one other important characteristic of maps and globes.

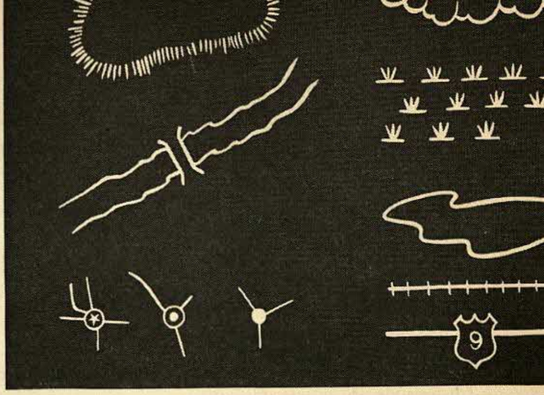


Fig. 7.5. In what ways are map symbols like new words in reading?

ABSTRACT CHARACTER

By nature, maps and globes are abstract. Their language is one of symbols, lines, colors, names, and space relationships. A dot fixes the location of a city. A line of one type means a highway; another represents a political boundary; still others designate rivers, railroads, trade routes, elevation contours, natural boundaries between water and land, direction, or other features (Fig. 7.5).

Usually these symbols on a map have little visual resemblance to what they represent. Sometimes, as in the case of parallels, meridians, and contour lines, they represent things that cannot actually be seen anywhere on the earth's surface. Hence, in order to read maps and globes successfully, we must be able to interpret many symbols and colors.

Color helps to make a map readable, but the colors used are different from those in nature. Since it is obviously impossible to show the actual colors of land and water surfaces as they vary with season, vegetation, rainfall, location, and other factors, the cartographer must assign somewhat arbitrary meanings to the colors he uses.

In consequence of such factors as these, maps are abstractions to begin with and therefore are inherently difficult for the pupil beginning his study of them.

GLOBES

A spherical map on a globe is the only true map of the earth because the earth itself is a sphere. In actuality, the earth is not a perfect sphere, but the divergence is so slight as to make no practical difference. The diameter of the earth at the equator is 27 miles greater than its north-south diameter at the poles. This 27 miles is one-third of 1 percent of the earth's diameter. On a 10″ globe the difference amounts to less than half the thickness of a dime, a difference which no eye can detect. Thus for any but the most highly technical purposes, the earth may be described as a true sphere.

The surfaces on most globes are printed as flat gores. When they are being mounted on the sphere, these gores are stretched slightly so that they will fit together properly on the spherical surface. Thus, if one "peeled" a globe he would be unable to flatten out the sections any more successfully than he could in the case of the grapefruit shell. The film *Impossible Map* illustrates this interestingly and effectively.[2]

TYPES OF GLOBES

There are various sizes and types of globes. Size is usually indicated in terms of diameter, the most common sizes being 8, 12, 16, 20, and 24 inches. The 8″ globe is suitable only for individual study; the 12″ and 16″ globes are most frequently used for group or class purposes. Slated or project globes in the 20″ and larger sizes are also being used widely in schools. A plastic globe which can be inflated like a balloon is shown in Fig. 7.6.

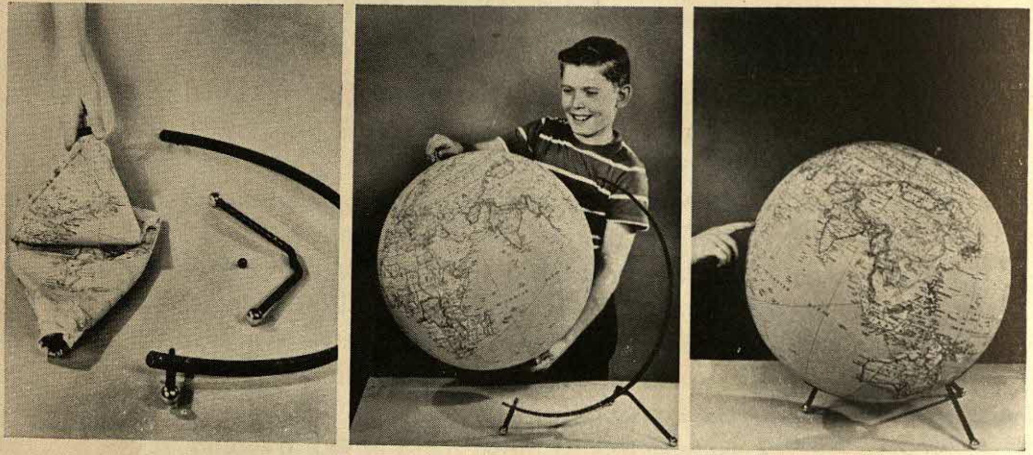
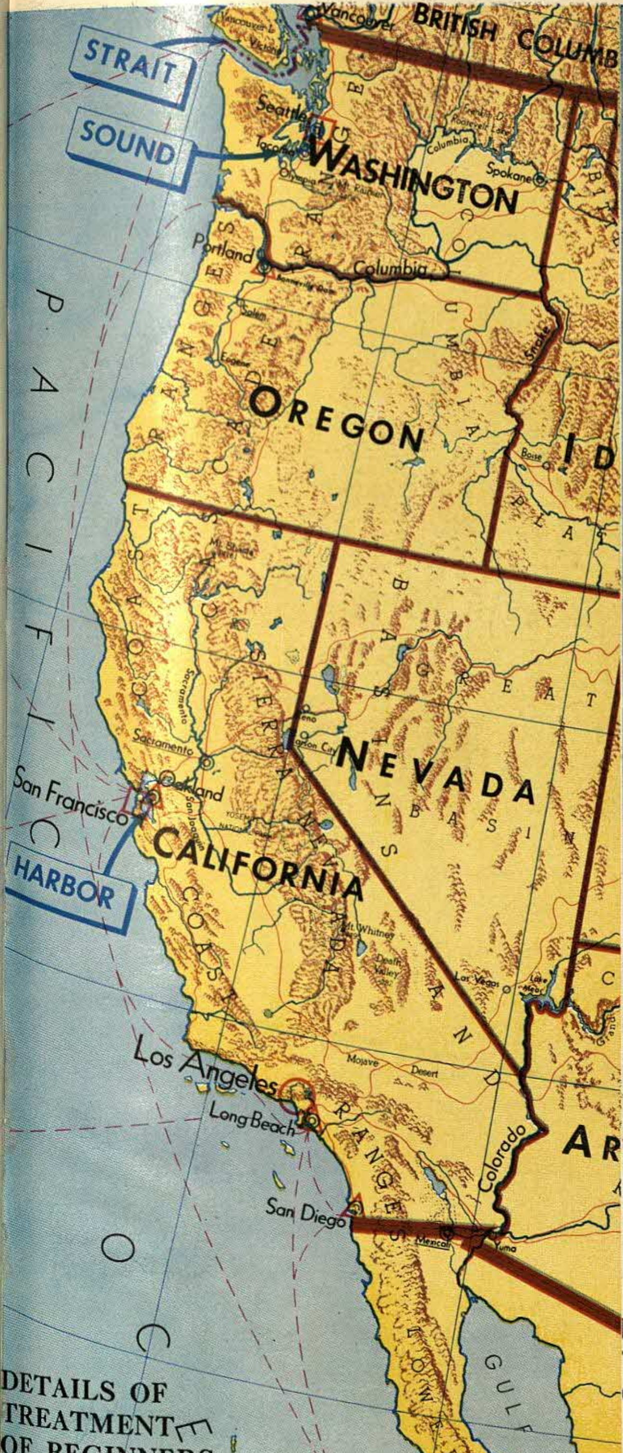


Fig. 7.6. This plastic inflatable globe is one attempt to solve the problem of the cost and fragility of good globes. This one is unbreakable and weighs less than two pounds.

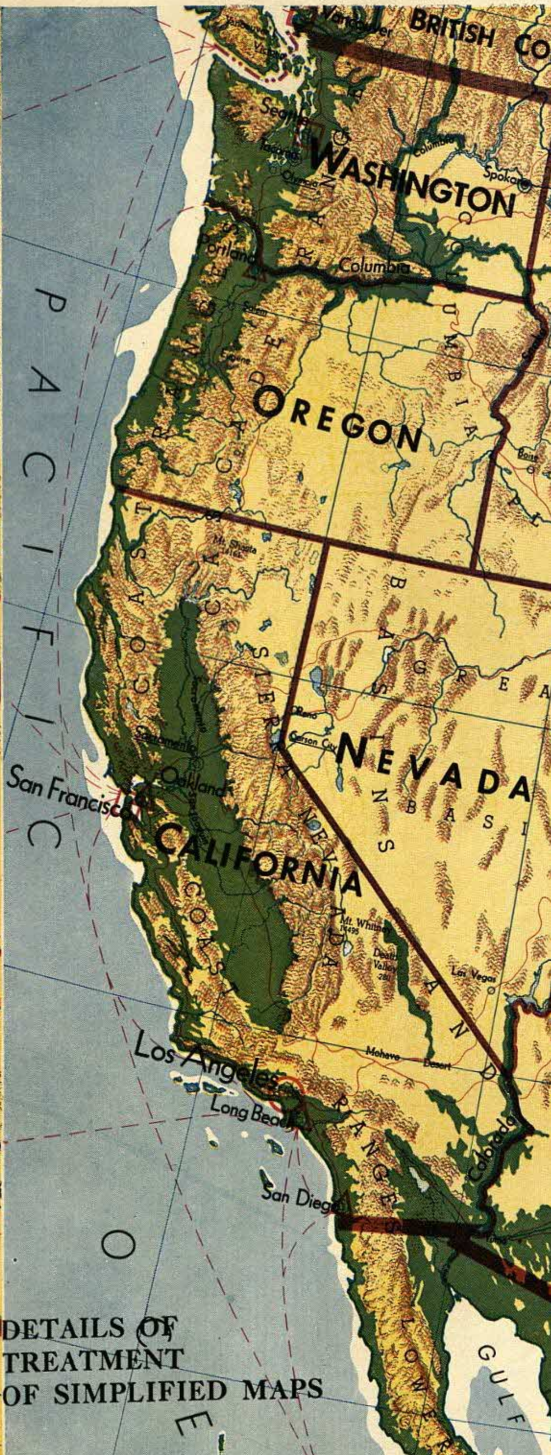
Other factors aside, it would be highly desirable, of course, for all globes to be large enough to be seen readily by an entire class. However, the prohibitive cost of hand-covered globes larger than 16″ and the amount of space required for a globe large enough for an entire class to see, are factors which have prevented the use of larger globes in most schools. A notable exception is found in a few schools where teachers and pupils have constructed large globes of their own. An example of such a globe is shown in Fig. 7.7.

[2] *Impossible Map*, 16mm., Sound, Color, 10 min., National Film Board of Canada.

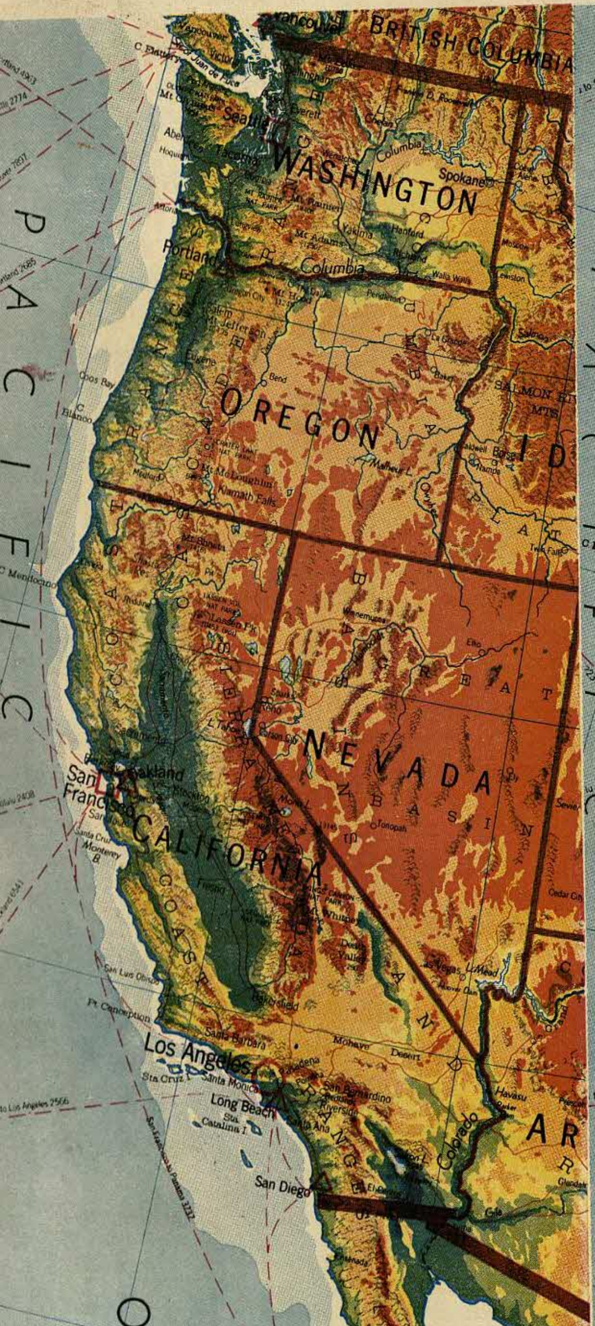
Opposite page: Sections from two elementary maps. The section at the left is primarily a political map for beginners, with few place names and only major relief indicated. The section at the right shows altitude tints for land and water areas.



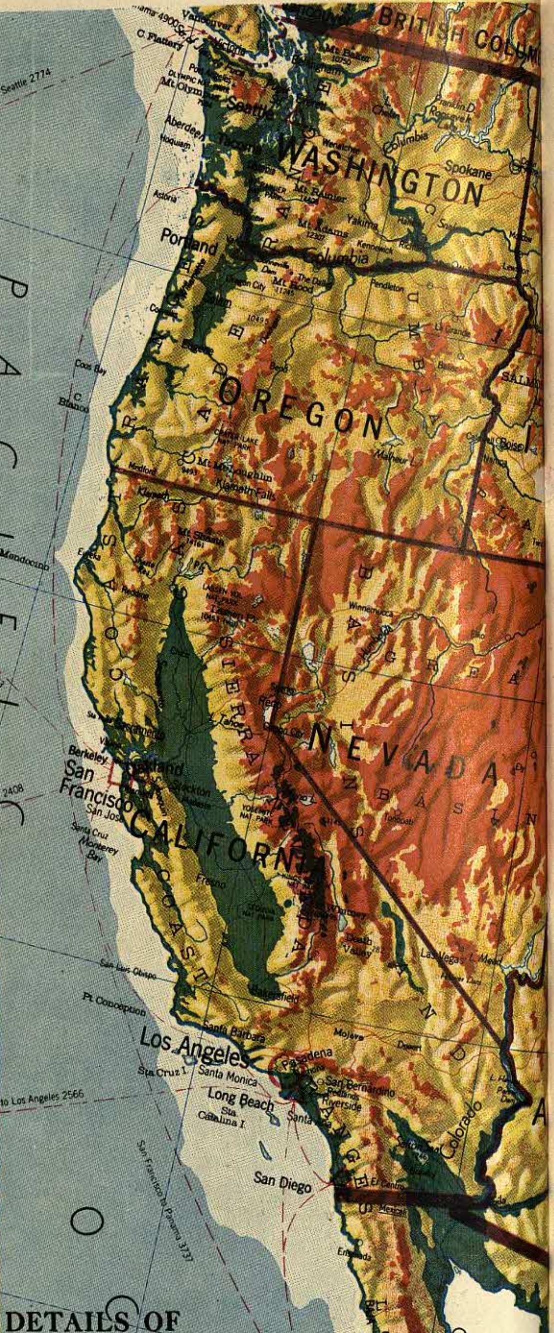
DETAILS OF
TREATMENT
OF BEGINNERS
MAPS AND GLOBES



DETAILS OF
TREATMENT
OF SIMPLIFIED MAPS



ETAILS OF
REATMENT
F PHYSICAL-POLITICAL
APS



DETAILS OF
TREATMENT
OF
RELIEF-LIKE
MAPS

This globe was made on a braced chicken-wire frame covered with papier-mâché. The bracing frame was constructed in two halves by the Industrial Arts Department. Starting with the application of grid lines, the teacher and pupils drew in the continents and other surface features desired. Work continued for several years before the globe was completed.

Three principal types of globes are valuable for school use: *political globes, physical-political globes,* and *slated outline globes.* Globes which are designed primarily to show the location and boundaries of countries, principal cities, trade routes, and other features created by man are called political globes. A simplified political globe with a minimum of details is desirable for use in the primary grades. If the flat maps that are used later on have identical colors, the transition to flat maps will be easier for the young learner. The color plates facing pages 178 and 179 show corresponding sections of political and phsyical-political maps.

Physical-political globes, as the name implies, show some political features also, but their primary emphasis is on land elevations and ocean depths shown by means of altitude tints. Such globes are very practical for use at the intermediate-grade levels and above, because they combine essential physical features with sufficient political information to show relationships between the two. Physical-political globes and wall maps with the same coloration are of continuing value in the middle and upper elementary grades when map-reading skills are being developed.

The slated outline globe (Fig. 7.8) is of great value at all grade levels. Instructors and students can write on it with chalk, indicating such features as locations; air, sea, and land routes; and great circles. Psychologically the unique advantage of this globe is that it permits attention to be focused on one thing at a time. In addition, it is particularly well suited for direct pupil activity and experience. Globes of this type are available with the continents outlined and with grid lines as well as plain surfaces. Since slated globes are less costly to manufacture than those with printed surfaces, these globes are relatively inexpensive in proportion to their size.

There are various other special globes such as air-age, celestial, physical relief, and even satellite globes (Fig. 7.9). Each has particular advantages for specific purposes. The transparent globe pictured in Fig. 7.10, for example, is used to illustrate the changing locations of stars and planets with reference to the earth's surface.

Opposite page: Sections from a physical-political and a relief type of map. The principal distinction between the two is the shading technique that is used on the section at the right to create a three-dimensional effect. Note also the additional place names and detail on these two sections as compared with the two preceding.

Also available are plastic globe sections of major geographical areas. Their possibilities for individual and group study are suggested in Fig. 7.11. These relief sections are strong, light, and easily handled by students. Sections can be readily colored or cleaned and hung vertically if desired.

SELECTING GLOBES FOR TEACHING PURPOSES

Having determined the types of globes required for his purposes, the instructor should be aware of certain general considerations that apply to the selection of specific types of globes. These considerations pertain particularly, though not exclusively, to globes having printed surfaces, such as political and physical-political globes.

Accuracy. Actually only hand-covered globes provide absolute accuracy, for the gores of which they are made are carefully wetted and stretched by hand so as to fit perfectly on the spherical surface.

Mounting can be done by machine at considerably lower cost but with

Fig. 7.7. What advantages does a very large globe like this one offer? Such globes can be made by your pupils.

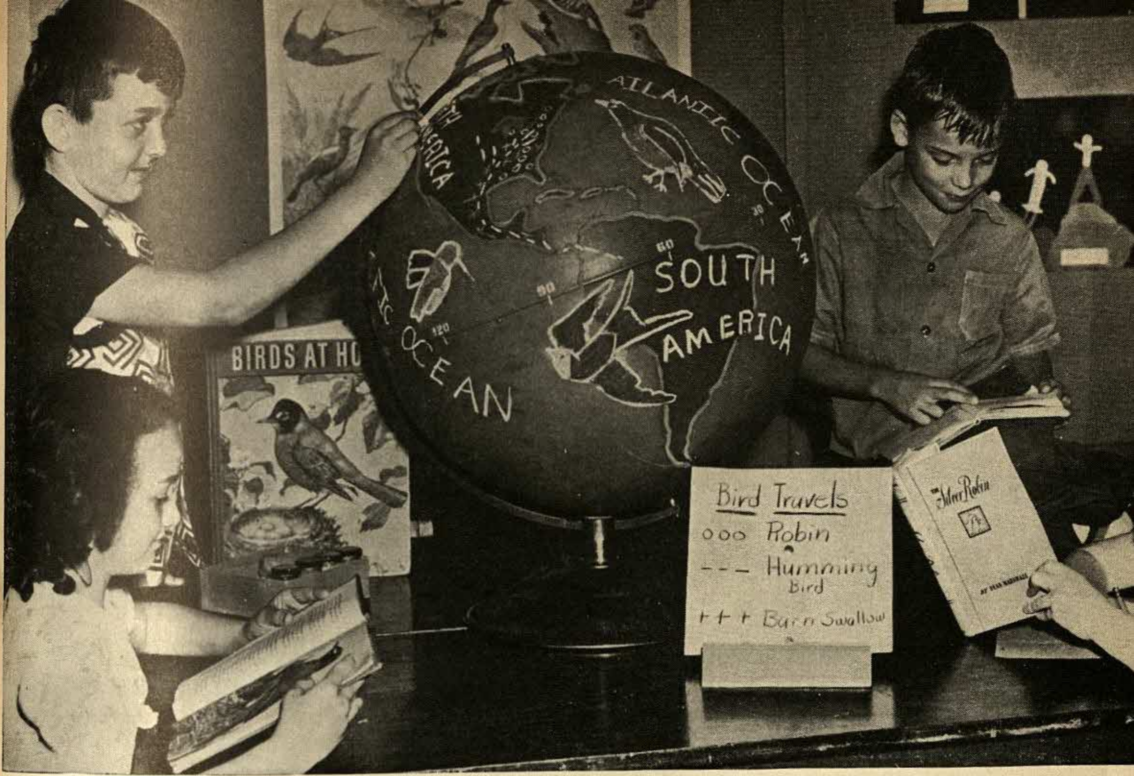


Fig. 7.8. Slated globes have many useful applications such as that indicated here. Globes provide maximum learning potential when used with maps, pictures, and reading materials.

lessened accuracy. In machine mounting, the northern and southern hemispheres are printed separately and joined to make a complete globe. The manufacturer of machine-made globes usually makes no claims for the accuracy with which the gores or hemispheres match, or the durability of the globe as compared to the durability and accuracy possible with hand mounting on steel or plastic balls.

It is not intended here to overstress the importance of accuracy of globes for school use. For many purposes, inexpensive machine-made globes are useful, particularly if several can be made available for each room. But a good globe will last for years with reasonable care, and it will serve effectively both for general observations and for highly specific references. In terms of these considerations—and particularly where funds are limited—a good globe is the best buy.

Size and Readability. Details on a globe are intended primarily for study by individuals and small groups at close range. Such broad features as hemispheres, land-water relationships, and the relative location of continents can be seen by the entire class, however, and for such purposes the globe should be as large as possible. In this connection, the type of mount-

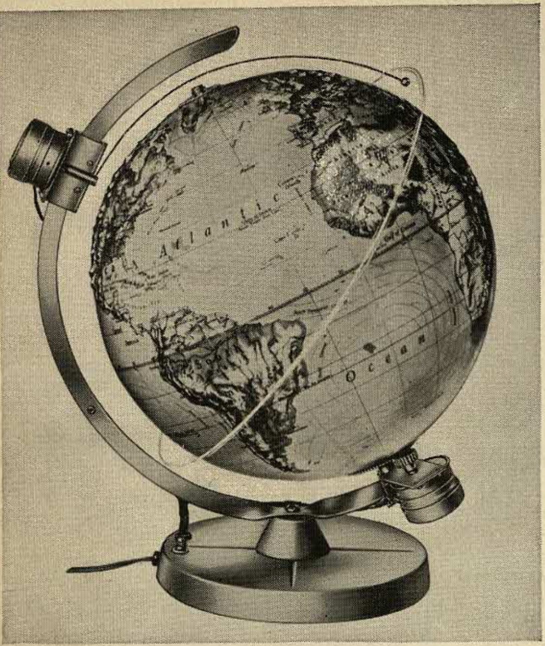


Fig. 7.9. A satellite globe simulates the constantly changing orbital path of an object in space as the earth rotates beneath it.

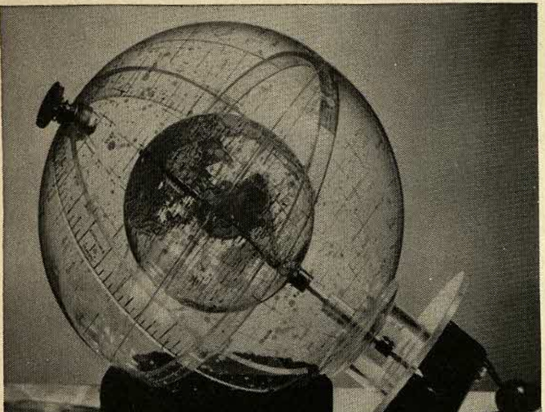


Fig. 7.10. Various transparent globes are available, including larger terrestial globes like the one inside this star-terrestial globe. The one here shows such concepts as time determination, the ecliptic circle, and the earth's relationship to the sun, planets, and stars as it rotates on its axis, and is used in studying celestial navigation.

ing becomes important (Fig. 7.12). A further consideration is the fact that printed data can be presented more clearly on a 16″ globe than on a 12″ globe because the surface of the first globe is nearly 78 percent larger. (The surface area of a 12″ globe is 452.39 square inches; that of a 16″ globe is 804.25 square inches.)[3] A third factor is that distance can be estimated somewhat more easily on a 16″ globe because the scale is a convenient 500 miles to 1 inch, whereas the scale on a 12″ globe is 670 miles to 1 inch.

Simplicity. Closely related to legibility, in a globe as in a map, is simplicity. A globe is not an atlas; although much essential information can be presented on it, the inclusion of minute, rarely needed details is unnecessary for its effective use. In recognition of this problem, manufacturers have made political globes and physical-political globes with simplified regional surface features for beginners. For more advanced work the traditional political and physical-political globes are periodically revised not only to keep them up to date but also to remove unnecessary details.

Color. The use of color on globes, as on maps, serves two important purposes. The first and more significant purpose is to aid legibility by distinguishing such fea-

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[3] Weber Costello Company, *1950–51 Map and Globe Catalog MG-42,* p. 4.

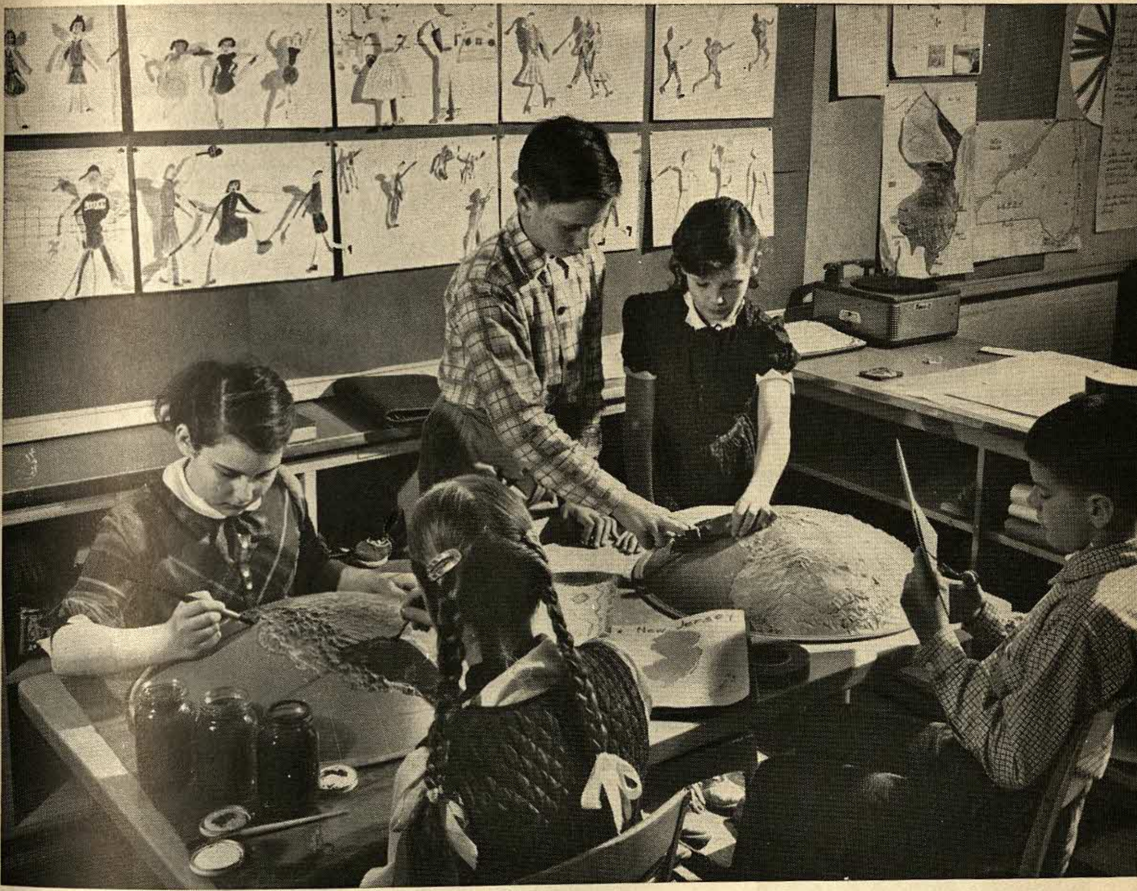

Fig. 7.11. Plastic spherical sections provide another way in which the earth's surface may be studied.

tures as land and water, lowlands and highlands, and political divisions. The second purpose is a matter of aesthetics; this is also important, because pleasing colors can contribute to the favorable reception of a map, atlas, or globe.

In general, the colors on physical-political globes follow the international color scheme used on the 1:1,000,000 physical map of the world. Aside from this, there is no standard color pattern for either maps or globes. On the whole, a good color contrast that gives optimum legibility and pleasing appearance is the major factor to be considered. Lighter shades are usually more satisfactory than deep primary colors. Colors should implement the teaching effectiveness of the globe rather than attract attention themselves.

The surface of all globes is treated with a transparent coating to protect it from undue wear. It is important that this coating should not reflect light to the extent of producing a glare and reducing visibility. A semiglossy finish provides a smooth surface that can be cleaned easily and creates little glare.

WALL MAPS

PRINCIPAL TYPES

Wall maps are available in three principal types—physical maps, or maps which show terrain; political maps, which show governmental areas; and special-purpose maps. There are numerous combinations and variations of these basic types, such as physical-political maps, regional maps, and such special-purpose maps as those showing land use, population distribution, rainfall, or historical development (Fig. 7.13).

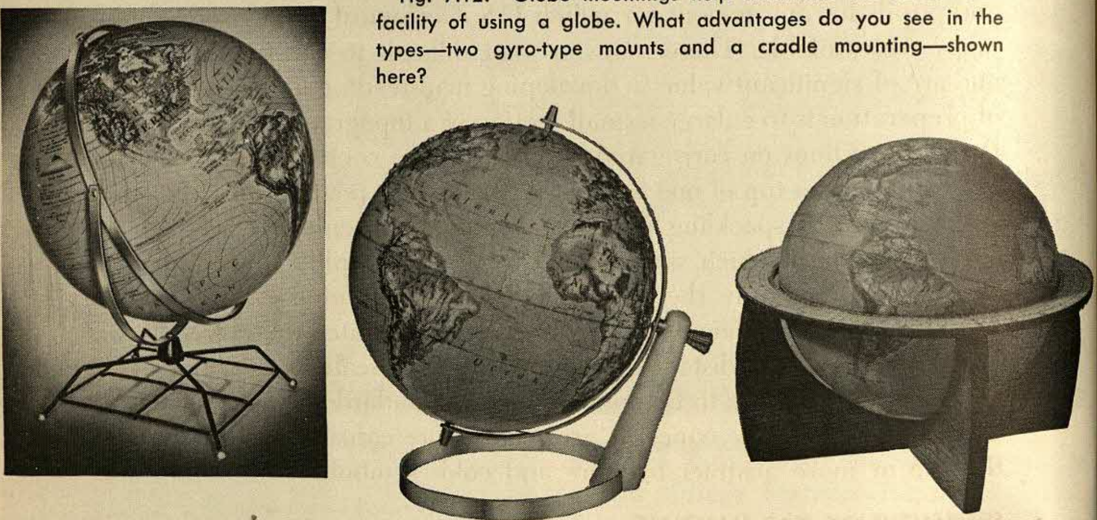

Fig. 7.12. Globe mountings help determine the nature and facility of using a globe. What advantages do you see in the types—two gyro-type mounts and a cradle mounting—shown here?

Political maps show phenomena which are principally man-made, such as national, state, and county boundaries; the location of cities, highways, and railroads; and national and state parks.

The common road map is a good example of a political map. Another example is a world map showing colonial possessions and the mother country in the same color.

Frequently certain terrain and political features are shown on the same map; such a map is known as a *physical-political map*. These maps are particularly useful in illustrating certain relationships between the terrain and man's settlement of the land. For example, the small number of large cities in mountainous regions is readily shown on a physical-political map.

Physical maps emphasize terrain and topographical concepts. These concepts are necessary for understanding such matters as why people live where they do, some aspects of agricultural production, climate, and routes of transportation. The elementary concepts of mountains, valleys, plains, deserts, rivers, rainfall, and temperature all involve an understanding of topography.

Some flat maps visualize relief effectively by shading one side of mountain ranges, thus giving a three-dimensional appearance (Fig. 7.14). Excellent relief maps in three dimensions are available in sturdy, light-weight, inexpensive plastic. These maps enable students to feel as well as see the surface features of a region (Figs. 7.15 and 7.16).

Three-dimensional relief maps of local areas can be made by teachers and pupils for any regions for which U.S. Geological Survey topographical maps are available. These maps are not difficult to construct (Fig. 7.17) and are of significant value in developing map-reading ability. One method of preparation is to enlarge a small section of a topographical map and trace the contour lines on corrugated cardboard. The contours are then cut out and mounted on top of one another in the correct relationship. The surface is covered with spackling plaster and painted when dry.[4]

Physical maps which show actual relief and amplify it with color and shading are probably the most effective type of physical wall map for school purposes. Although any relief map exaggerates the elevation in relation to horizontal distance, this difference in scale is essential if topographical features are to be noticeable; it is standard practice among mapmakers. Land surface concepts are made more concrete by relief than by the use of more abstract hachure and color symbols.

SUPPLEMENTARY MAP MATERIALS

In addition to the standard types of maps described above, and the many valuable special-purpose maps available, several useful supplementary map materials deserve mention. These include projected maps, slated wall outline maps, and chalkboard stencil maps.

Projected Maps. A map in an atlas or reference book can be projected on a screen by a good opaque projector, thus permitting the class to see and discuss it as they do a wall map.

Map slides in the small 2″ x 2″ or the larger 3¼″ x 4″ size are available commercially on a variety of current and historical topics. Handmade slides likewise have useful applications in social studies classes both for the students who make them and for those who see them.

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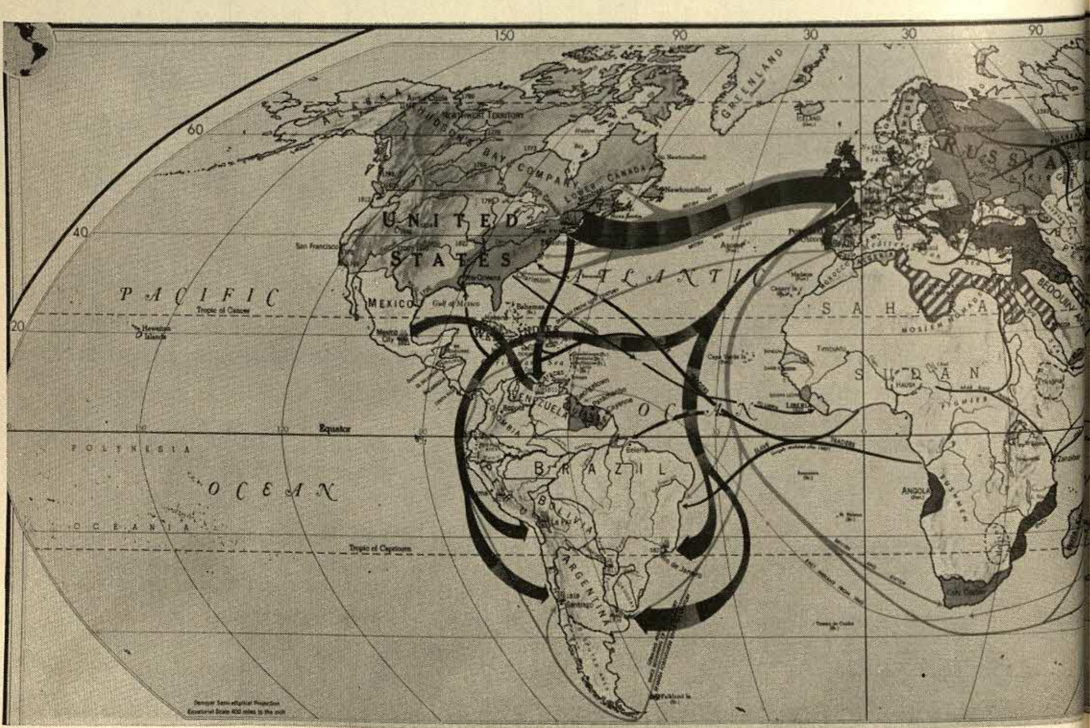
[4] For a detailed description of this process, see C. F. Schuller, "3D for Better Map Communication," *Audiovisual Instruction*, May, 1956, pp. 76–77.

Map transparencies for the overhead transparency projector (see Chapter 12) are of particular benefit to the teacher who wishes to emphasize certain physical, political, or special-purpose map features and omit others. These overlays enable him to present detailed map information without extensive room darkening. Similarly, outline maps can be prepared on clear acetate with a grease pencil and filled in as the discussion proceeds.

Projected maps make possible, among their other advantages, a considerable number and variety of maps at low cost, variation in methods needed by both teachers and students from time to time, and enlargement of maps so that details can be seen readily by the entire group.

Slated Wall Outline Maps. Teachers know that pupils learn by doing, that directed pupil activity is necessary for "fixing" concepts in their minds. Teachers also know that complex ideas must be built up step by step, with each step simply and clearly defined. The slated wall outline map (Fig. 7.18) is very helpful in applying both of these teaching principles.

The instructor can draw one thing at a time on a slated map without the class being distracted by extraneous details. Teachers know well how group interest is heightened when one member of the class goes to the map



and chalks in a name, outlines an area, or traces an important parallel or trade route under the watchful eye of the rest of his classmates.

Like the modern chalkboard, slated maps have been made attractive by the use of color. A slated world map and a slated globe on the same scale provide an excellent combination for teaching important area and location concepts.

Chalkboard Stencil Maps. An interesting and practical addition to a school's map materials is a chalkboard stencil map, a wall map that has perforations along state and national boundries (see Fig. 3.6). A dusty chalkboard eraser rubbed over the surface of such a map transfers the map outline to the chalkboard.

Stencil maps are used in much the same way as are slated wall maps. The stencil map is particularly well suited when it is desired to have a number of pupils at the board at the same time, because as many maps can be stenciled on the chalkboard as space permits. They are also convenient when the instructor wishes to present an additional illustration or two without disturbing work already on the slated map. Chalkboard stencil maps can be made rather easily on an inexpensive window shade; a few stencil maps are available commercially.

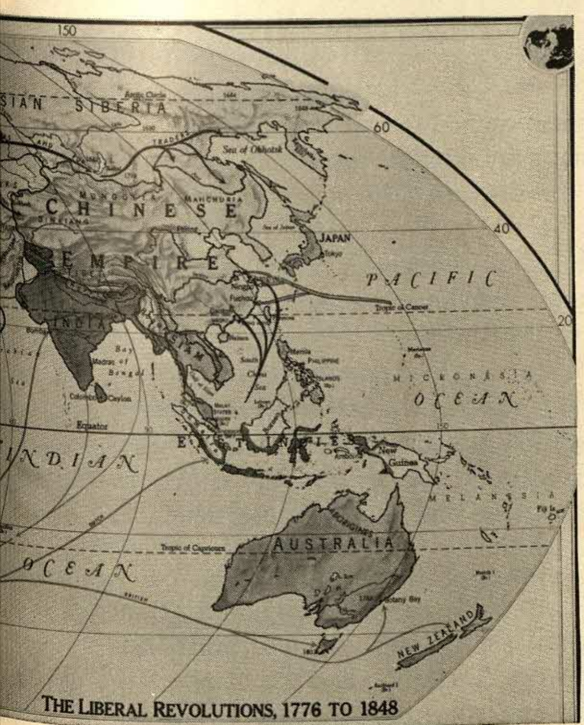


Fig. 7.13. Maps can be helpful to both teacher and pupil in bringing history to life. Aside from the value of expertly prepared materials, what other benefits do such maps offer?

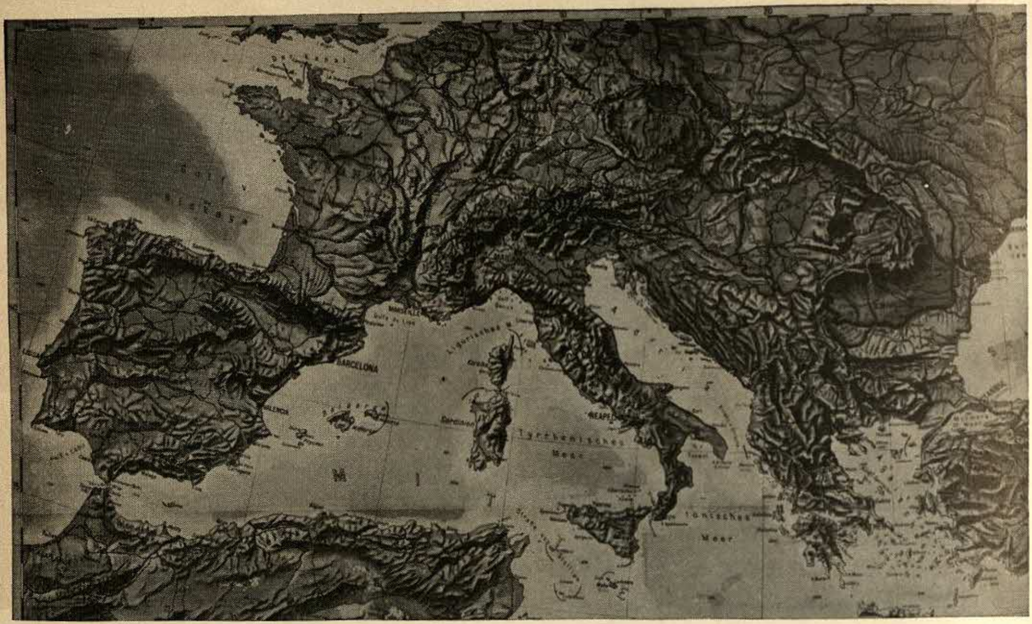


Fig. 7.14. An understanding of topography is necessary for many social studies concepts. Some flat maps like this show relief effectively by shading one side of mountains so as to give the appearance of elevation.

EVALUATION AND SELECTION OF WALL MAPS

Although some degree of inaccuracy is unavoidable on any flat map, we must not overlook the fact that such maps are nonetheless highly ingenious and valuable materials of instruction. A world map, for example, provides the *only* means whereby we can see the whole world at one time. On a standard globe, we can see no more than half the world, however we spin or tilt the globe. Wall maps are the most convenient means available for enabling all the members of a class to see the same thing on a map at the same time.

The great number of maps available is testimony to their universal acceptance as valuable teaching materials. But it also raises the practical question of how to choose among them. Here we consider first the functions which wall maps can serve to best advantage and then consider them in terms of several physical criteria.

Function of Wall Maps. The wall map is designed to highlight major features. One writer refers to such maps as "pointer" devices and gives the following explanation: "This means that the wall map is not there to serve every purpose for which teachers and students may require a map,

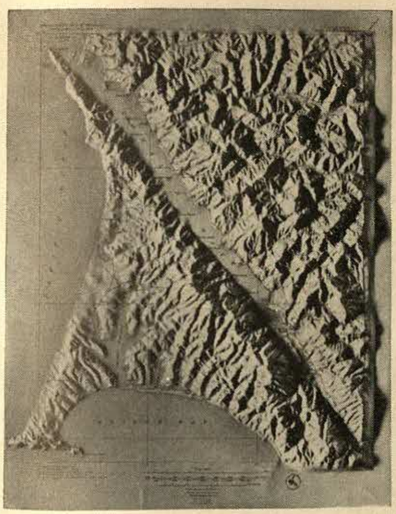


Fig. 7.15. Three-dimensional relief maps in lightweight plastic permit close-up study and feel of the terrain.

THE UNITED STATES OF AMERICA

but to make it possible for teacher or students to point out to others in the room some essential features in the distributions which a given map shows."[5]

Similarly, the most effective wall maps do not contain numerous kinds of information on the same map. A good political map, for example, typically presents political boundaries, principal cities, rivers and water areas, and important transportation routes; depending upon the level and function of the map, a few other features may be included. Normally such additional information as contour lines, land use, and rainfall or population distribution is not presented on the same map because too much material makes the map difficult to read and use. Emphasis on one type of information and the avoidance of extraneous details are characteristic of good maps.

Small inset maps are frequently printed on the margins of a wall map to provide such information as rainfall, vegetation, thermal regions, and population distribution. This information is valuable, of course, and it is useful for small-group close-up study; it may also be helpful in reading the larger map. Sometimes inset maps are used to fill up space when the large map is wide and rather squat in shape, as is true of some world maps. It is generally preferable to have the main map larger than to use up space for insets which, at best, can be seen only at close range. An atlas or textbook map is more convenient and more efficient for detailed map study.

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[5] Edna E. Eisen, "Maps, Globes and Charts," *American School and University*, 1947, p. 190.

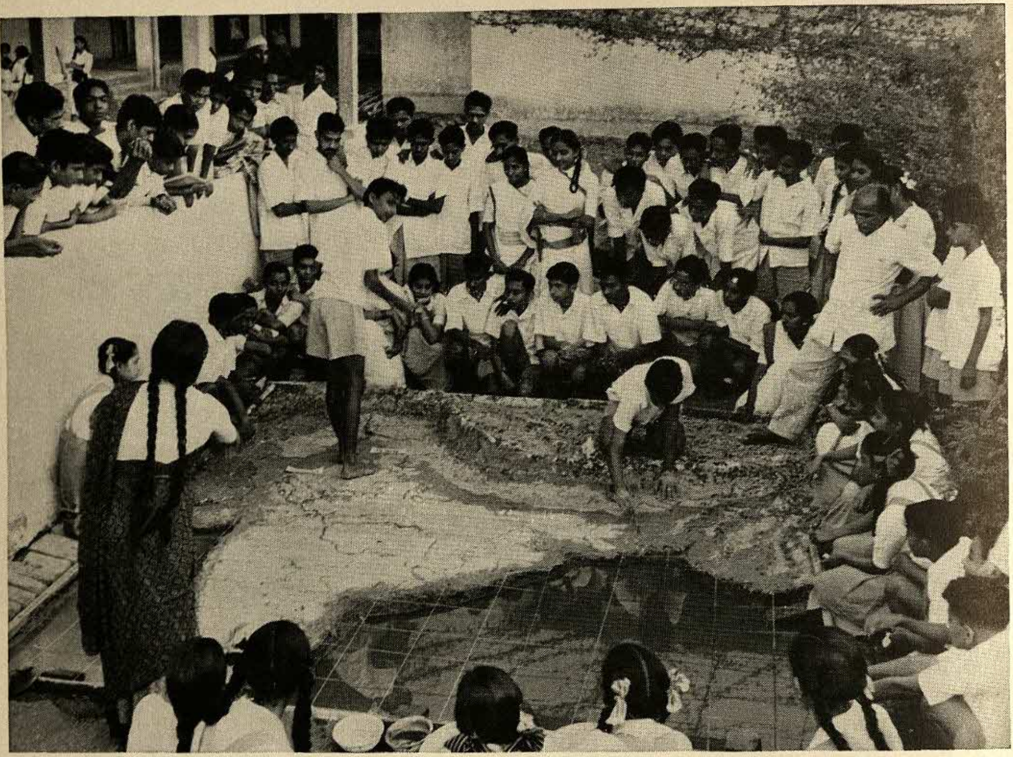

Fig. 7.16. What learning opportunities are possible as these Indian pupils study and work with this relief map of their country? Could you adapt this project to help pupils understand their own locality?

Desirable Characteristics of Wall Maps. Most wall maps are attractive in appearance, and this is certainly to be desired. Less obvious but of much greater importance to the instructor, however, are other factors—what type of projection is used on world or hemisphere maps; how complicated the map is to read; whether it is large enough to be seen easily in the classroom; and how effectively color has been used. Let us examine these considerations more closely.

SUITABILITY OF THE PROJECTION. The term "map projection" means the method by which the spherical surface of the earth is flattened out in making a flat map. There are many different map projections, each designed to achieve somewhat different purposes. As was said earlier, the Mercator projection is made for navigators; it is the only projection on which a straight line is a true compass line. Hence a ship's navigator can draw a straight line between two points on a Mercator map and, with complete confidence, steer the course thus indicated.

Some projections represent area reasonably accurately; others are relatively accurate as far as the shape of land and water areas is concerned; others make it possible to read distances accurately from the center of the map; and still others have the property of true direction. Unfortunately no flat map can provide all these properties (actually few can offer more than one), so a choice is necessary. Earlier in the chapter we pointed out why it is important for schools to use flat maps which give a correct impression of area. The projection on which such maps are based is called the *equal-area projection.*

On maps of regions less than a hemisphere in size, the errors in area are small enough so that, for general school purposes, it makes little difference what projection is used. It *is* important, howevever, for the teacher to know how to determine whether a map of the world has good area representation. Fortunately, he can do this rather easily by comparing the pattern of the grid lines on a globe with that on the flat map. This is called the *grid comparison method.*

The term "grid" refers to the parallels (latitude lines) and meridians (longitude lines) which cartographers universally use as reference lines in plotting their maps. Parallels start at the equator and run parallel to it as east-west lines extending around the earth. Meridians start at Greenwich, England, and exend north and south from pole to pole. Position on maps is measured in terms of the number of degrees east or west longitude and the number of degrees north or south latitude. In essence, therefore, projection is the process of transferring the grid system of a globe onto a flat surface, then drawing in the land areas, point by point, according to the position each has on the globe grid.

Since the globe grid provides the only completely accurate map there is of the earth's surface, visual comparison of that grid with any flat map grid will reveal any differences. Although at least ten important characteristics of the globe grid are used in such comparisons, only four are concerned in determining whether a flat map has good area representation:

1. Parallels are parallel.
2. Parallels are equidistant from equator to poles.
3. Meridians are equally spaced on the parallels and converge toward the poles.
4. The area enclosed by any two parallels and two meridians is the same anywhere between the same two parallels.

No flat map can be expected to have all the above characteristics. Therefore it becomes a question of how closely a given map approximates them. Examine the map grids in Fig. 7.19 and apply the above criteria for equal

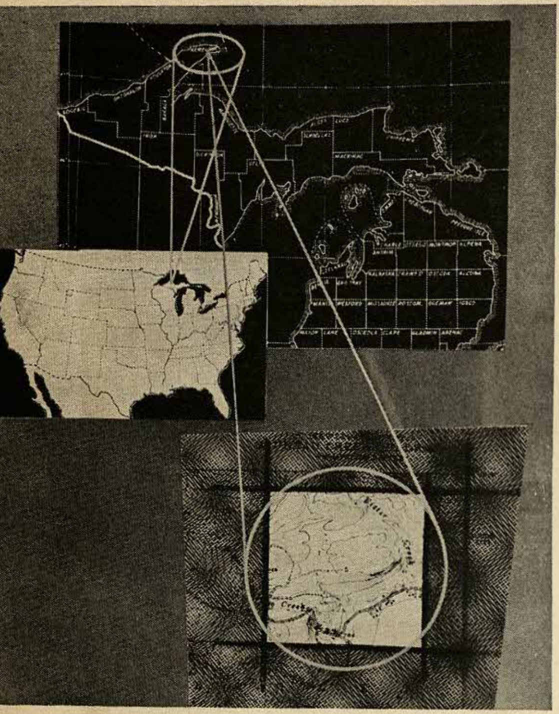

Fig. 7.17. A good terrain map of a local area can be made by teacher and pupils. These pictures show the principal steps involved in one method.

area. Then do the same with the world and hemisphere maps in your classroom or school. You will soon learn to distinguish which maps have good area characteristics.

Several suitable kinds of classroom map projections are available as *minimum error projections.* The values of these little-known maps have been described by Robinson.[6] These projections are a compromise in which areas, shapes, direction, and distance properties are balanced so as to present as realistic a map of a segment of the earth's surface as is possible. Although no property is completely accurate on a minimum error projection, the inaccuracies are moderate and inconspicuous to even a skilled observer. For other than technical or scientific purposes, therefore, these projections are quite satisfactory.

Several other projections which have specific properties come close to fitting into the minimum error group. Among these are the Lambert Conformal, the Albers Equal Area, and the Lambert Equal Area. The latter two give accurate area relationships, and the shapes on the Lambert Conformal are of above average validity. In addition, on all three projections there is a good balance of the remaining properties; the Lambert Equal Area, for example, presents correct area and true direction (it is the only projection that combines these two properties), good shape, and fairly good distance. The Lambert projections, unfortunately, are not usable for world maps.

It is a help in understanding map projections to know something of how they are made. The process is largely mathematical, but the principles can be visualized rather easily. If you place a translucent cylinder around a

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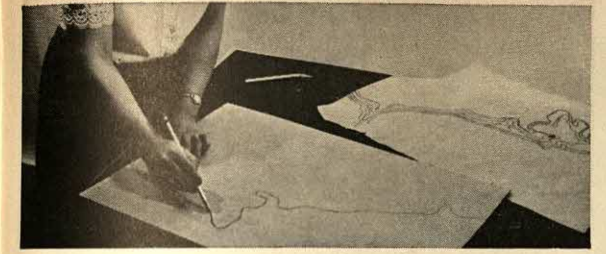
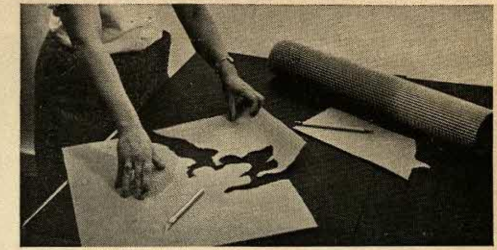
[6] Arthur Robinson, "An Analytical Approach to Map Projections," *Annals of the Association of American Geographers,* December, 1949, p. 287.





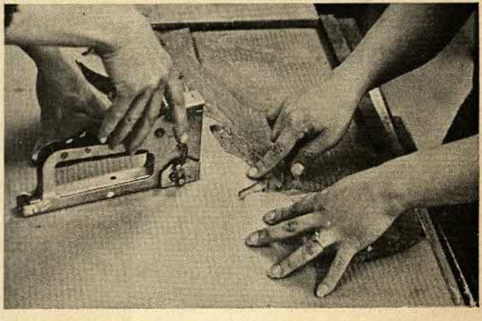
transparent globe with a light in it, the grid lines on the globe will be "projected" on the surface of the cylinder. With some modification, this is the Mercator projection referred to earlier.

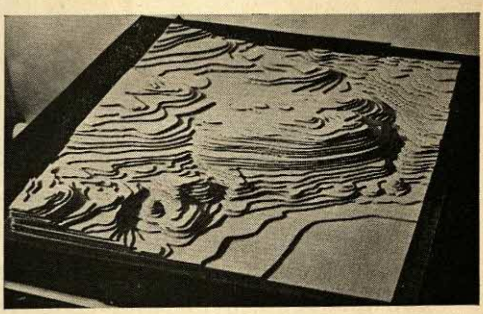
If you place a flat or plane surface against the lighted globe, a different pattern of grid lines is projected. With a cone, still another pattern is projected. And each of these projections, of course, is different from the grid on the globe itself. As was said earlier, it is impossible to transfer the globe grid onto a flat surface without altering it considerably. Fig. 7.20 shows a projection device such as that described, and several of the patterns of grid lines that result.

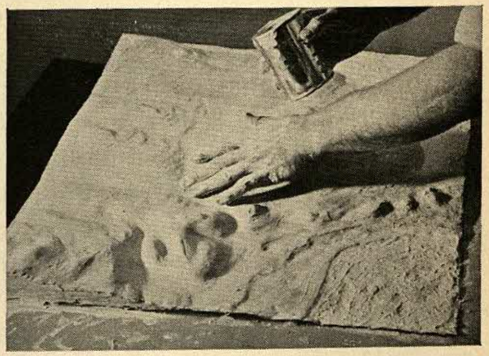
SIMPLICITY AND APPROPRIATENESS TO GRADE LEVEL. No teacher would think of using an eighth-grade reading text with a second-grade class. Yet often the same maps are used at all grade levels, with little apparent regard for their complexity.

Wall maps are frequently too crowded with information. As a result they are difficult to read from more than a few feet away and are hard for the average pupil to interpret.

It is unnecessary to provide a different map for each significant geographical concept, but there can and







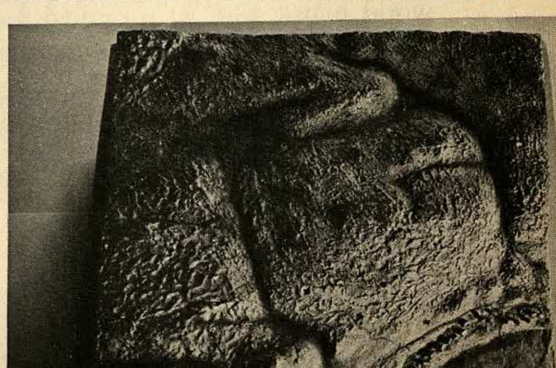


Fig. 7.18. The use of slated wall outline maps helps focus attention on specific points being illustrated, encourages student participation, and provides flexibility. Such a map can be used to advantage with a slated globe.

should be distinct levels of complexity in maps designed for primary, intermediate, secondary, and college use. In recognition of this need, map publishers are making available a steadily increasing number of graded maps.

SIZE AND VISIBILITY. Wall maps are visualizations devised to present complete or partial global surface information on a single flat surface. Wall maps of the world make it possible to sense key geographical, physical, or political concepts which would be less visible on a globe.

In order to be useful in classroom study situations, wall maps must be so designed and of such size that students seated normally about the room can see and "read" the important relationships revealed by the map. Important symbols, shapes, names of gross land and water masses, and key terrain phenomena must be presented by means of such effective color and size of print as to be visible and understandable to all viewers.

The printing on wall maps which relates to important concepts and the names of continents and countries should be in large type and suitably spaced so as to make reading it possible anywhere in the seating area. "In so far as any data on a map cannot be grasped by the eye, and easily read, in just that measure is the map encumbered with useless material, and is a failure."[7]

Precise studies by Luckiesh and Moss[8] have determined the relative visibility of printed type of varying sizes. The relative visibility of that used on wall maps and charts is one important basis of map selection. Other factors than type size—among them background contrast, variations in type design, and crowded elements—also influence legibility.

A study by Robinson[9] shows that 2″ letters at 30 feet appear the same as letters 1/9″ high at a normal reading distance of 18 inches. Letters 1/2″ in height require above-average vision to be read at 20 feet.

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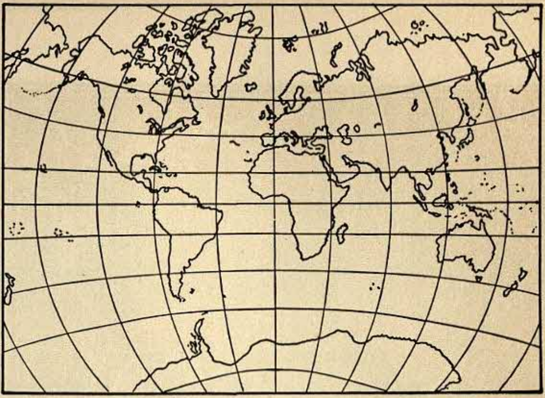
[7] J. Paul Goode, *Goode's School Atlas*, Rand, McNally, Chicago, 1918.

[8] M. Luckiesh and F. K. Moss, "The Quantitative Relationship Between Visibility and Type Size," *Journal of the Franklin Institute*, vol. 227, pp. 87–97.

[9] Arthur Robinson, "The Size of Lettering for Maps and Charts," *Surveying and Mapping*, January-March, 1950, pp. 37–44.

Ordinarily, world maps need to be larger than maps of continents or smaller areas. Because of the area covered by world maps, key relationships, to be visible, must be presented on maps at least 5 feet wide, preferably wider.

COLOR. Color is important from several standpoints in map selection. The most obvious of these is attractiveness. Closely related and more important is the effect of color on readability. Recognizing both factors, most map companies now avoid heavy or brilliant coloration which tends to attract attention to itself rather than to the map, is apt to be unattractive, and makes lines and printed data more difficult to read than they should be. However, primary children respond to bright cheerful colors,



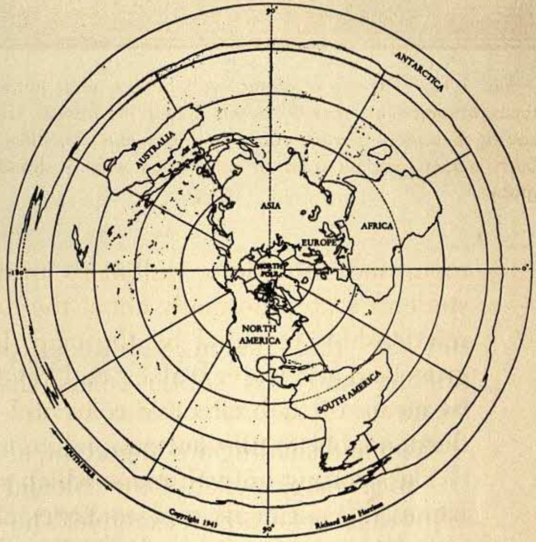
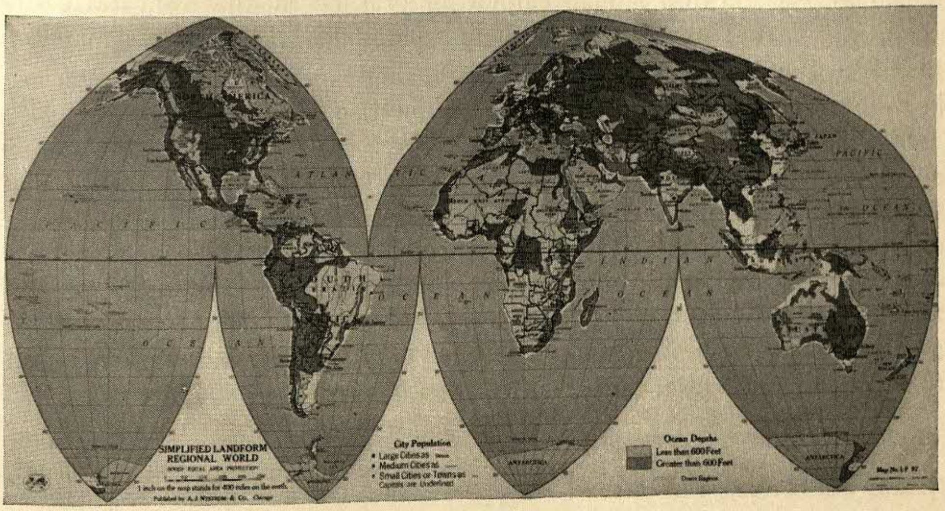


Fig. 7.19. In terms of the visual test for equal-area properties, how do these three maps measure up?



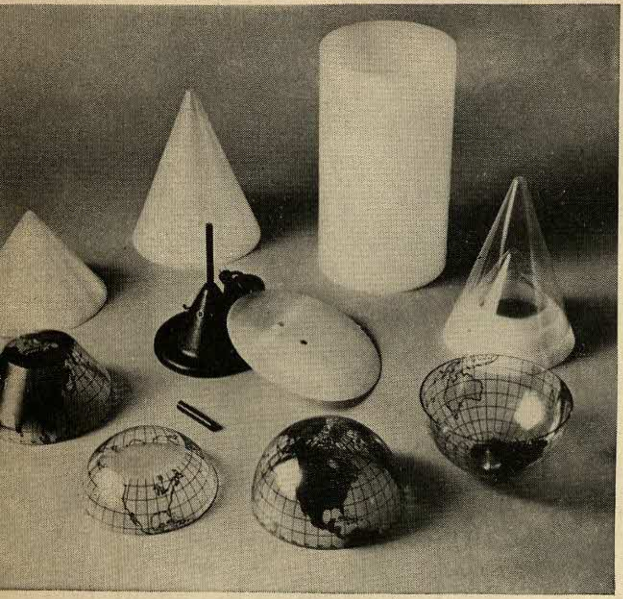


Fig. 7.20. A map projection demonstration kit. The black stand (left center) is capped by a small light. The halves of the sphere are slipped over the light tube. The translucent cones, cylinder, and flat surfaces are then applied as indicated in the top row of the drawings. The grid patterns formed by the light shining through the grid lines on the globe are shown on the lower row of drawings. Various other projections are also possible.

and for this reason publishers of beginners' maps use somewhat brighter and less subtle colors than are acceptable at higher grade levels.

Color and shading are important, also, in making maps easier to interpret. Historical maps which show colonial possessions and the mother country in the same color are an example. The value of using identical color schemes for world maps and globes, particularly at the elementary level, has already been mentioned. Color tints are also used to show elevation. However, because color leaves much to be desired in giving a correct impression of different land surfaces at the same elevation, shaded relief (see Fig. 7.14) has been used increasingly in recent years, sometimes combined with color.

Still more recently, instead of altitude tints, shaded relief has been used on physical maps with a naturalistic color scheme such as one might see from a plane at high altitude. Although the color aspects of a landscape are not stable, a color scheme is chosen which represents landscape colors during good weather in the summer and is keyed to major vegetation differences. For example, grass areas are a lighter green than forest regions, and deserts are buff, brownish yellow, or gray. Texture is sometimes used to represent cultivated areas.[10]

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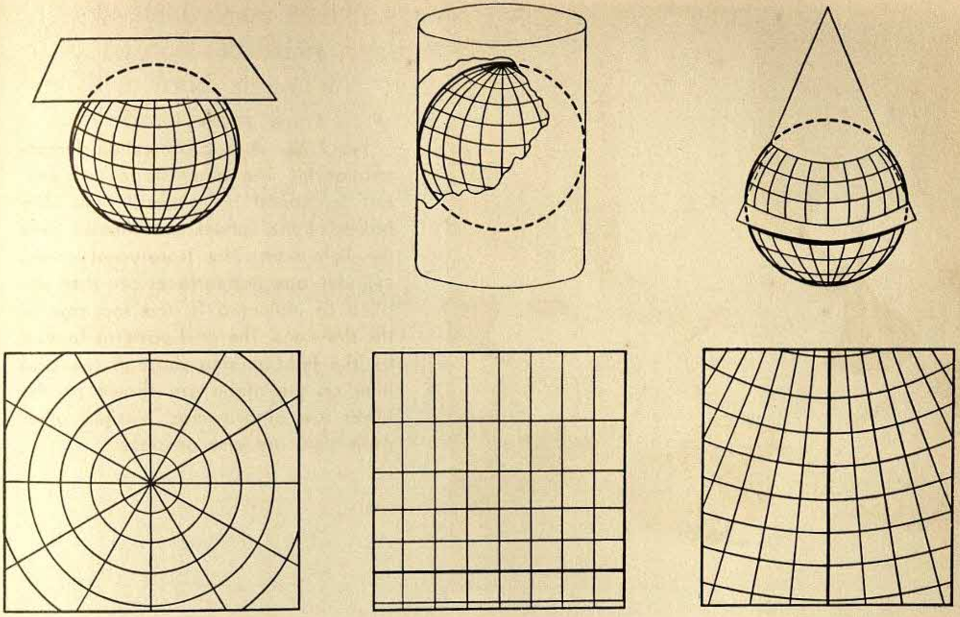
[10] Edward B. Espenshade, Jr., "Cartographic Developments and New Maps," *29th Yearbook*, National Council for the Social Studies, 1959, pp. 99–103.



EFFECTIVE USE OF MAPS AND GLOBES

"An intelligent citizen must use maps," says a social scientist. "From maps in newspapers and magazines, he obtains information on world and local affairs. Students in school also use maps as a source of information. If student and adult alike are to receive the full value from maps, they must be able to read them easily and accurately."[11]

"If correct concepts of world relationship are to be gained, one must have a globe. The globe is the best representation of the world that we have. . . . Every school room, even in the primary grades, should have a globe."[12]

These representative statements suggest that teachers at all levels need to consider seriously how to use maps and globes better in instruction so that students will learn (1) to read them, and (2) to interpret them.

MAP-READING READINESS

Globes and maps, as we have seen, represent the earth or sections of it by means of lines, colors, and symbols which bear little resemblance to the actual appearance of the earth's surface as a child sees it. Maps have a lan-

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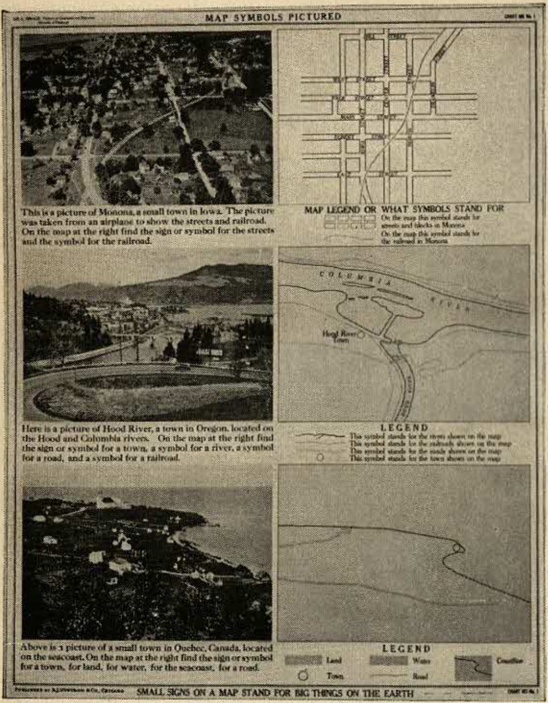
[11] Kathryn T. Whittemore, "The Place of Maps in Social Education," *Journal of Geography,* March, 1948, p. 110.

[12] Zoe A. Thralls, "The Use of the Globe," *Social Education,* April, 1947, p. 165.


MAP SYMBOLS PICTURED

This is a picture of Monona, a small town in Iowa. The picture was taken from an airplane to show the streets and railroad. On the map at the right find the sign or symbol for the streets and the symbol for the railroad.

MAP LEGEND OR WHAT SYMBOLS STAND FOR

On the map this symbol stands for streets and blocks in Monona

On the map this symbol stands for the railroad in Monona

Here is a picture of Hood River, a town in Oregon, located on the Hood and Columbia rivers. On the map at the right find the sign or symbol for a town, a symbol for a river, a symbol for a road, and a symbol for a railroad.

LEGEND

This symbol stands for the rivers shown on the map

This symbol stands for the railroads shown on the map

This symbol stands for the roads shown on the map

This symbol stands for the town shown on the map

Above is a picture of a small town in Quebec, Canada, located on the seacoast. On the map at the right find the sign or symbol for a town, for land, for water, for the seacoast, for a road.

SMALL SIGNS ON A MAP STAND FOR BIG THINGS ON THE EARTH

Fig. 7.21. Pictures add meaning to maps and map symbols.

guage all their own which, like any language, must be learned (Fig. 7.21). No one is born with the ability to read maps and globes. He must learn this just as he must learn how to read words, sentences, and paragraphs. And the learning can be an exciting adventure.

Start with the pupil where he is. Instructors are familiar with this principle. It is inherent in good teaching at all levels. It is also a way of expressing another principle—that before symbols of any kind are taught, pupils must have a background of experience which can give these symbols concrete meaning.

Where *is* the child so far as globes and maps are concerned? What is he familiar with that the teacher can use as a basis for beginning to teach him globes and maps? His home and yard, his immediate neighborhood, the way to school, his schoolroom, the school yard, and perhaps other parts of the community where his class has gone on a field trip.

"Children begin early and without direction to represent places they have seen by representing them with blocks or other materials. After a Buffalo kindergarten class had visited the Peace Bridge, the children built a model of the bridge across the classroom. They were able to tell which end of their bridge represented the Canada end and which represented the end near their school. They pointed out where the river flowed beneath the bridge."[13]

The importance of observation and field trips to nearby areas for young children is universally stressed as a basis for building initial geographical concepts. "No geography worthy of the name is possible," says Scarfe, "without constant reference to a completely understood home region."[14]

In developing map skills in the primary grades, Sabaroff emphasizes the

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[13] Kathryn T. Whittemore, "Maps," *19th Yearbook*, National Council for the Social Studies, 1948, p. 120.

[14] N. F. Scarfe, "Designing a Curriculum to Develop Geographic Concepts," *Journal of Geography*, February, 1956, p. 58.

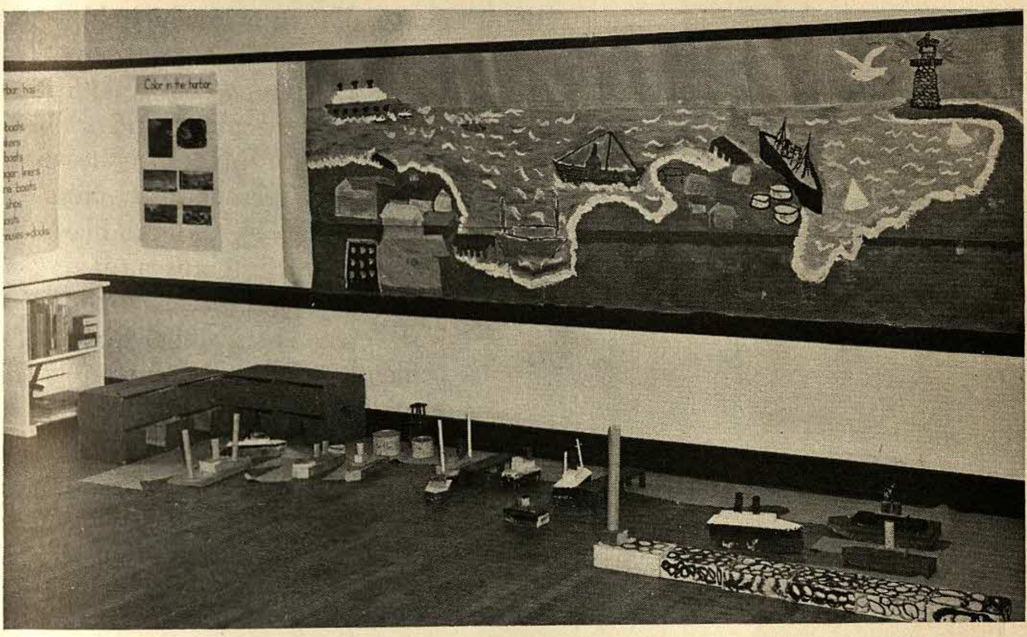

Fig. 7.22. This map of Los Angeles Harbor was made by primary pupils after a field trip. What educational benefits do you see in this kind of map activity?

importance of a geographical readiness program based upon the immediate environment.

Geographers agree that children should not be faced with a symbol on a map which does not bring to mind an image of the reality for which it stands. Elementary pupils need carefully graded and appropriately sampled experiences in observing real landscapes in the immediate world around them. They must be given opportunity to think over, discuss and relate what they have seen. They must be allowed to map what they themselves have seen and discussed and to read simple maps made by others for which they now have adequate images.[15]

By the time they are in the third grade, children are ready to participate in making pictorial maps of familiar sections. The harbor as they saw it will be faithfully reproduced; and such things as ships, docks, and the lighthouse are likely to be drawn realistically (Fig. 7.22). Perspective and scale may be crude or entirely absent, but nevertheless such maps show the beginning of a feeling for relative size, location, and distance. Providing experiences which naturally give rise to pictorial murals and maps is a good way to begin formal map work. Before long, symbols can be introduced to represent streets, buildings, important landmarks, and topographical fea-

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[15] Rose Sabaroff, "Firsthand Experiences in Geography for Second Graders," *Journal of Geography*, September, 1958, p. 306.

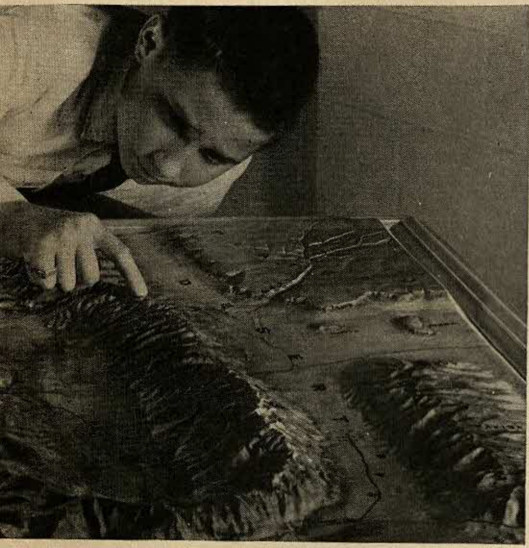

Fig. 7.23. The language of maps involves learning numerous geographical terms, such as those on this three-dimensional representation of topographical features.

tures. These new meanings will be revealed through careful study of standard geographical terms. Fig. 7.23 is a 3D representation of topographical features that aids the student in comprehending such terms as plateaus, ridges, and valleys.

Use pictures. Pictures play a vital part in map-reading readiness. They are an interesting supplement to field trips, besides opening large areas of the earth to observation which would otherwise be impossible. Early concepts of land surfaces and climate can be developed through pictures and films. Charts are available which combine pictures with large-scale maps of small areas to illustrate the meaning of various map symbols (see Fig. 7.21).

In introducing specific methods of using pictures along with maps and globes to teach the concept of scale and the meanings of symbols on maps, Odell stresses the following point: "There are an infinite number of ways in which pictures can be of assistance in teaching and lead directly into the use of globe and maps. In the teaching of map understanding and map reading alone, there are many examples of desirable picture use. The use of pictures and maps can be an aid to 'seeing' the relationships."[16]

Use a globe. A globe is an essential part of any map-reading readiness program. Not only are all flat maps derived originally from the globe, but it is by all odds the best medium for developing a true idea of the earth's sphericity. Every elementary schoolroom, even in the primary grades, should be equipped with a globe. For primary rooms the globe should be a simple one, perhaps showing primarily the land and water areas, the poles, and the equator. It should be easily accessible so the pupils can handle it.

Whipple suggests that, during the first two years of the social studies curriculum and prior to systematic instruction in Grade 3, the pupils learn beginning concepts and generalizations about the earth itself, its lands and

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[16] Clarence B. Odell, "The Use of Maps, Globes, and Pictures in the Classroom," *29th Yearbook,* National Council for the Social Studies, 1959, p. 207.

Fig. 7.24. Curiosity and a readily available globe set the stage for new learning. World concepts on globes and maps can have meaning only after a pupil knows about his own locality and state.

waters, climate and the seasons, man's use of the land, what maps are, and certain skills preparatory to map reading.[17] The importance of having a globe constantly at hand is clear if the learners are to acquire such concepts as the earth's sphericity and rotation, the explanation for day and night, the poles and the meaning of direction, and the large proportion of the earth's surface which is covered by water.

GLOBES AND MAPS IN THE INTERMEDIATE GRADES

In the fourth, fifth, and sixth grades, the above concepts, generalizations, and skills suggested for the first three grades are developed at a more advanced level. Systematic instruction includes *use* of globes and maps, plus increased skill in reading them.[18] History and geography are brought together in meaningful context, each reinforcing the other and establishing an initial basis for a better understanding of why people live where and how they do today.

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[17] Gertrude Whipple, "Geography in the Elementary Social Studies Program," *29th Yearbook*, National Council for the Social Studies, 1959, pp. 118–122.

Introduce physical-political globes and maps. When North and South America and the other lands of the earth are studied in the fifth and sixth grades, the globe should be used regularly to establish and maintain correct concepts of relative location, size, and climatic influences (Fig. 7.24). Physical-political maps and globes are used at this level and cross reference between them should become habitual.

Clarify scale concepts. As more maps are used, the scale assumes significance and its meaning must be carefully taught to avoid extensive misconceptions. The ability to determine locations in terms of latitude or distance from the equator, when combined with the ability to read scales, enables the pupil to compare and contrast different countries. He may discover such fundamental facts, for example, as that Japan has approximately the same area as California and over six times as many people. Such discoveries stimulate questions and set the stage for further meaningful learning.

Have the pupils make maps. One valuable application of "learning by doing" is to have the pupils make maps of their own. This is excellent for developing both map-reading ability and the power to interpret the data on maps. "The preparation of one's own maps," suggests a noted geographer, "through . . . plotting data upon a base map provides not only training in observation, but leads to a fuller understanding of maps as a medium of communication."[19]

It is important here to distinguish between mere copy exercises and crea-

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[18] *Ibid.*, pp. 122–136.

[19] Edward B. Epenshade, Jr., *op. cit.*, p. 95.

tive map construction. While there are certain values in transferring the thirteen colonies from a textbook map to a desk outline map, this should not be confused with actual map construction or the learning values accruing therefrom.

Relief maps of a local area provide an excellent basis for understanding surface features of the area and the physical and elevation symbols used on physical maps. These three-dimensional maps can easily be made by the teacher and pupils (see Fig. 7.17). U.S. Geological Survey topographical maps are available for most local areas and should be used, along with firsthand observation, for accurate construction. Several methods of construction give satisfactory results.[20] The great value of this type of map is that it is considerably more realistic than any flat map and accordingly can be very valuable in giving meaning to the physical symbols of flat maps.

GLOBES AND MAPS IN THE SECONDARY SCHOOL

A wide variety of maps and globes is essential at the secondary level where world concepts are developed on a broad scale. By this time the student should have learned to interpret maps as well as to "read" them, but this ability cannot be taken for granted. All too frequently he will have missed something along the line, perhaps because the teacher himself was not well enough trained. In any case, map reading, like English and spelling, is the responsibility of teachers at all levels. If the secondary-school pupil lacks basic map-reading skills, he must be taught them before he can proceed successfully.

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[20] For details of a simple method of constructing a plastic relief map see Ralph C. Preston, *Teaching Social Studies in the Elementary School,* Rinehart, New York, 1950, pp. 237–243.

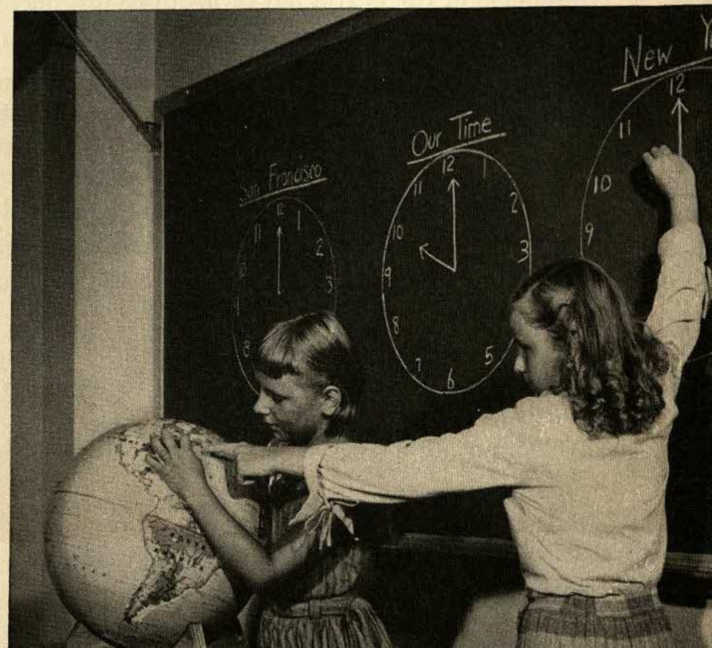


Fig. 7.25. A demonstration by the teacher explains day and night. The students apply this knowledge in exercises, and the class begins to understand time.

In the junior high school new concepts must be learned such as the equinoxes and solstices, time zones (Fig. 7.25), the international date line, and great-circle routes. Globes are invaluable for teaching such concepts, and slated globes are particularly helpful for related pupil exercises. At the junior and senior high-school levels numerous special-purpose maps containing economic, historical, and literary data are used regularly, in addition to physical-political maps and globes. Before completing senior high school, a student should have become adept at both reading and interpreting a variety of maps and globes. If he is fortunate, his teachers in various subjects will use maps effectively themselves and will recognize the continuing need to help him improve his ability to the point where he is as much at home with maps as he is with books.

As with all other forms of audiovisual materials, the good instructor selects and uses the globes and maps that achieve his purposes better than any other materials available to him. He uses them in combination with such other materials as textbooks, reference books, atlases, flat pictures, slides, films, filmstrips, field trips, bulletin board displays, and desk outline maps —according to the needs of his class. He recognizes that these materials are means rather than ends in themselves—means to gaining a clear and vital understanding of the geographical, social, and cultural concepts that give meaning to the world we live in.

SUMMARY

Globes and maps are a vital part of the school's instructional materials because they are the only means by which large areas of the earth, or the earth itself, can be effectively represented. Although globes are the only true maps of the earth, flat projections are necessary for detailed study, for ease of viewing, and for seeing the whole earth at one time.

Flat maps of the world are unavoidably inaccurate in two or more of the following properties of the globe: correct area, shape, direction, and distance. For most school purposes, good area representation is of primary importance in preventing basic misconceptions. It is necessary, therefore, that the teacher be able to determine whether small-scale maps have good area representation. He can do this visually by comparing the map grid with the grid on a globe as far as four characteristics are concerned.

Additional factors in evaluating flat maps are simplicity, size, legibility, and color. Maps for beginners should be simplified, larger than is commonly the case, and colored so as to enhance both legibility and attractiveness.

Appropriate globes for teaching purposes include simplified political globes for beginners, slated globes, and physical-political globes. Simplicity, size, visibility, and color considerations also apply in selecting globes. Several sizes and mountings are available. Although most globes cannot be read from a distance of more than a few feet, there are advantages in using globes 16″ or larger rather than smaller ones.

Valuable supplementary map and globe materials for group and individual instruction include map slides and transparencies, slated wall outline maps, and chalkboard stencil outline maps. Plastic relief maps and pupil-made large-scale relief maps of local areas are of great value in teaching map reading.

Effective use of maps and globes is based on map-reading readiness; this is developed in the primary grades through extensive observation of the local environment. The use of pictures and, later, of motion pictures and other instructional materials gives important meaning and visual imagery to maps and globes.

Systematic instruction in geographical concepts and in reading globes and maps begins in the third or fourth grade and continues thereafter. Geography instruction today incorporates history and cultural concepts to the end of promoting better understanding of the peoples of the earth. The ability to interpret maps, above and beyond the essential ability to read them, is vital to the development of this understanding.

Suggested Activities

1. Prepare a simple test on map reading and give it to the class. Include such items as the following:
   a. Alaska is nearly as large as the United States. (True or false?)
   b. Greenland is larger than Mexico. (True or false?)
   c. Name six countries the 40th parallel runs through.
   d. In what general direction is Moscow from Chicago?
   e. Which of the following is the most direct route from San Francisco to Japan:
      (1) Westward via the Hawaiian Islands.
      (2) Westward, but slightly north of the Hawaiian Islands.
      (3) Northwestward along the Alaskan coast and the Aleutian Islands.
      (4) Northward and nearly over the North Pole.

   Have the students check their own papers and discuss the implications of the errors that were made.
2. Using the grid comparison method, analyze several wall maps of the world and determine which have good area representation.
3. Examine catalogues from several map and globe companies and select specific globes and wall maps for use in one of the following: (a) a primary room, (b) an intermediate room, (c) a social studies room in senior high school,

(d) an adult class in world affairs. Be ready to state the reasons for your selections.

4. Send for the following materials to add to your audiovisual library:
    a. *Around the World* and *Teaching and Learning with Maps, Globes, and Pictures,* A. J. Nystrom & Co., 3333 Elston Ave., Chicago 18, Illinois, free.
    b. *Toward Better Understanding and Use of Maps, Globes, and Charts,* Denoyer-Geppert Co., 5235 Ravenswood Ave., Chicago 40, Illinois, free.
    c. *Handbook of Map and Globe Usage,* by Ruby M. Harris, Education Division, Rand McNally & Co., P.O. Box 7600, Chicago 80, Illinois, $1.79.
5. Obtain a road map of your state, a map of the United States, and a map of Europe. Compare the legends on these maps. Note differences in the symbols used for such things as cities, railroads, highways, etc., and also differences in the way these maps indicate rivers, mountains, plains, deserts, etc.
6. Examine your local newspapers, magazines, and even the books you are using to see how widely maps and globes actually are used in our daily lives. Be alert for ideas and materials that you can use in teaching.

Bibliography

Chace, H., "Developing Map Skills in Elementary Schools," *Social Education,* November, 1955, pp. 309 ff.

Chace, H., "Using Maps in Teaching History," *Journal of Geography,* November, 1960 pp. 380–385.

Eisen, Edna E., "Maps, Globes and Charts," *American School and University,* 1947, pp. 188 ff.

Fisher, Irving, and Miller, O. M., *World Maps and Globes,* Essential Books, 1944.

Harris, Ruby, *Handbook for Maps and Globes,* Rand McNally, 1958.

Hoffman, H. W., "Map Comes Alive," *Journal of Geography,* February, 1956, pp. 77–80.

James, Preston (ed.), "New Viewpoints in Geography," *29th Yearbook,* National Council for the Social Studies, 1959.

Krohn, C. F., "Interpreting Maps and Globes," *23rd Yearbook,* vol. 24, National Council for the Social Studies, 1953, pp. 146–177.

Manno, A., "Junior Map Makers," *Grade Teacher,* January, 1961, pp. 20 ff., 204.

McAuley, J. D., "Maps and Globes in the Elementary School Program," *Journal of Geography,* December, 1960, pp. 431–433.

Peattie, Roderick, *The Teaching of Geography,* Appleton-Century-Crofts, 1950.

Preston, Ralph C., *Teaching Social Studies in the Elementary School,* Rinehart, 1950.

Raisz, Erwin, "Globes," *19th Yearbook,* National Council for the Social Studies, chap. 11.

Sabaroff, Rose, "Firsthand Experiences in Geography for Second Graders," *Journal of Geography,* September, 1958, pp. 300–307.

Siamis, Winifred, and Dekker, Marian, "Developing Geographical Concepts in Primary Grades," *Journal of Geography,* February, 1961, pp. 82–88.

Spec, M. Melvina, "Map-Reading with the Mind's Eye," *NEA Journal,* May, 1955, pp. 277–278.

Studebaker, J. W., "Terrain Models for Every School," *See and Hear,* February, 1946, pp. 49–54.

Sound Films

Airplane Changes Our World Map, B&W, 11 min., Encyclopædia Britannica Films.

Global Concept in Maps, B&W and Color, 10 min., Coronet Films.

Impossible Map, B&W and Color, 10 min., National Film Board of Canada.

Introduction to Map Projection, B&W, 18 min., United World Films.

Maps We Live By, B&W, 22 min., Films of the Nations.

Reading Maps, Color, 11 min. Encyclopædia Britannica Films.

Relief Models, Color, 10 min., Lipscomb College.

Understanding a Map, B&W, 10 min., Young America Films.

Filmstrips

Flat Maps of a Round World, 56 frames, B&W, Popular Science Publishing Company.

Introduction to Maps, 35mm. filmstrip series, Color, Jam Handy.
  What Is a Map? 27 frames.
  Coast Lines and Their Symbols, 31 frames.
  Land Farms and Their Symbols, 31 frames.
  Lakes, Rivers and Their Symbols, 30 frames.
  Towns, Cities and Their Symbols, 30 frames.

Making Geographic Models, 55 frames, Color, Teaching Aids Laboratory, Ohio State University.

Map Symbols, Dots and Lines, 60 frames, Color, Rand McNally.

Maps, Globes and Graphs, 24 frames, Color, Eye-Gate House.

Maps and Men, 44 frames, B&W, Popular Science Publishing Company.

Maps and Their Meaning, 53 frames, B&W and Color, Popular Science Publishing Company.

Starting with the Globe, 75 frames, Color, Denoyer-Geppert.

Using Maps and Globes, 48 frames, Color, Society for Visual Education.

We Live on a Large Globe, 52 frames, B&W and Color, Popular Science Publishing Company.

GOOD REFERENCE BOOKS
THE FIRST BOOK OF STONES

CHAPTER 8

THREE-DIMENSIONAL TEACHING MATERIALS

HAVE YOU EVER WATCHED a baby play with his toys?

As he sits in his high chair, his chubby little hands grasp whatever he can reach. Somewhat clumsily but with great concentration he pushes, pulls, and maneuvers his rattle around until he gets a grip on it. Then, with evident pleasure, he bangs it on his tray for a while, samples its flavor when he can locate his mouth, and eventually dumps it overboard for the satisfying crash that follows. Pick it up for him and he will repeat the process, with many variations, again and again.

Now let us observe his mother on a shopping tour. At the vegetable counter she picks up and squeezes several heads of lettuce before finding one that will do. She spies some cantaloupes. Again, with a serious little frown, she goes through the squeezing routine as the grocer looks on with patient resignation. She thoughtfully smells several which "feel" pretty good—and then walks on without taking any. The watermelons *do* look better today so she briskly thumps several until one produces a satisfactory hollow note. She buys it.

Meantime the baby's father is on his way back to the office from lunch. He stops in to see the new cars at the showroom. He isn't really thinking of buying a new car—as a matter of fact he still has several payments to go on the "old bus" he bought last year—but like most other men he likes to keep up with new developments in automobiles.

So he goes in just to have a look. There it is—a beauty, all polished and gleaming with chrome. Subconsciously aware of the danger, he keeps a safe distance and circles casually to look at the car from all sides. "That trunk looks a bit larger this year; wonder if it is?" he murmurs to himself. "Hmm—it is at that," he notes as he lifts the lid.

Shortly, of course, he finds himself behind the wheel, turning it just a little to get the feel and noting appreciatively the comfortable "give" of the seat cushions. "Wonder if they've put power on these small cars," he asks himself as he cautiously pushes the brake pedal several times. He tries the horn ever so gently, but nothing happens because the garage has thoughtfully disconnected it. At this point a benign salesman moves in, interrupting his reverie. He extricates himself from the situation with appropriate dignity, but as he goes on to his office a trace of that elusive but unmistakable scent of a new car seems to linger in his nostrils.

THE PHYSICAL SENSES IN LEARNING

Even as you and I, the baby and his parents in these familiar situations are learning and experiencing through their physical senses. Although we "think" with the brain, the raw material for learning and thinking must come initially through one or more of the physical senses. We can learn nothing without sensory impressions.

NEED FOR WELL-ROUNDED SENSORY EXPERIENCES

We know that the more complete, vivid, and accurate our sensory experiences are, the more effective will the learning experience be. Does this mean that we should bring all possible auditory, visual, and other sensory experiences to bear on every learning concept? The answer is no.

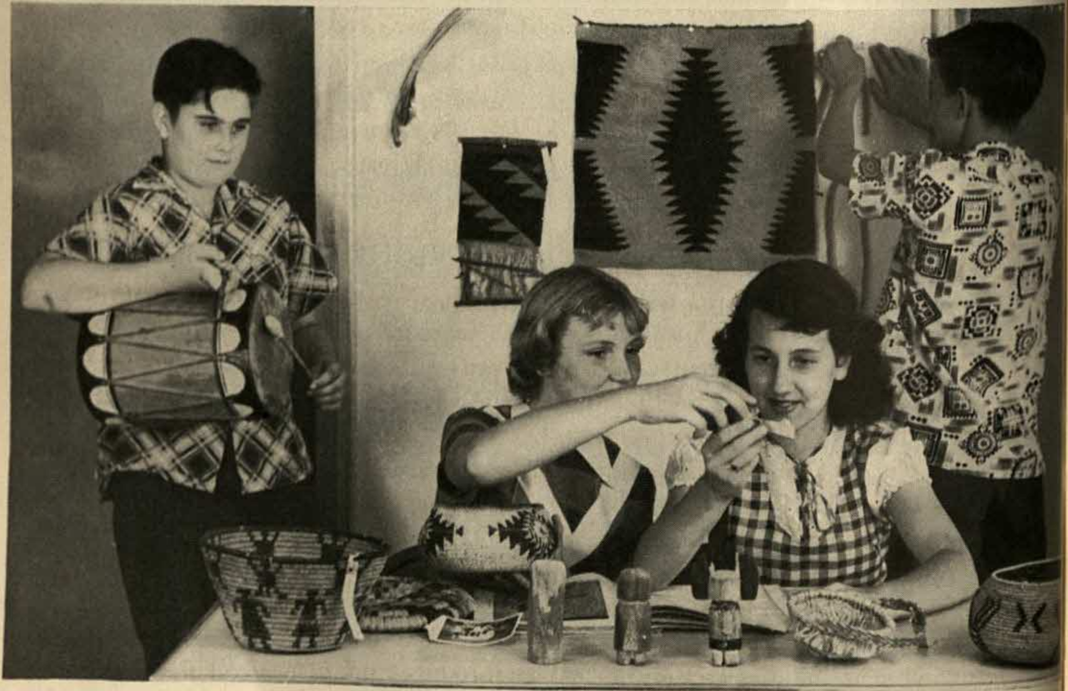
In discussing various audiovisual materials, we have stressed the importance of three principles of selection and use. (1) We select only materials which can make a distinct contribution to the specific learning task. (2) We choose the best *combination* of these and other teaching materials to achieve the desired results. (3) We use these learning materials in the ways most likely to accomplish our specific learning objectives.

To put it another way, (1) we choose teaching materials in terms of the kinds of communication that each type can best perform; (2) we put together a "team" of several types of appropriate materials; and (3) we put the team to work in the way dictated by the specific purposes and circumstances of a particular lesson.

Clearly, we are talking about *selective* experience, with materials and methods chosen to provide that experience. When sensory impressions can help to improve learning—as they can in many cases—these, too, must be selective. In a word, when sensory experience is involved, all pertinent senses should be employed to whatever extent is feasible (Fig. 8.1).

If familiarity with a bakery is important as a part of community study, a field trip to a bakery, a suitable film, and related reading materials might well be used. The film could provide an excellent overview of bakeries in

Fig. 8.1. Is this a legitimate activity of learning? To what extent are sensory impressions important?



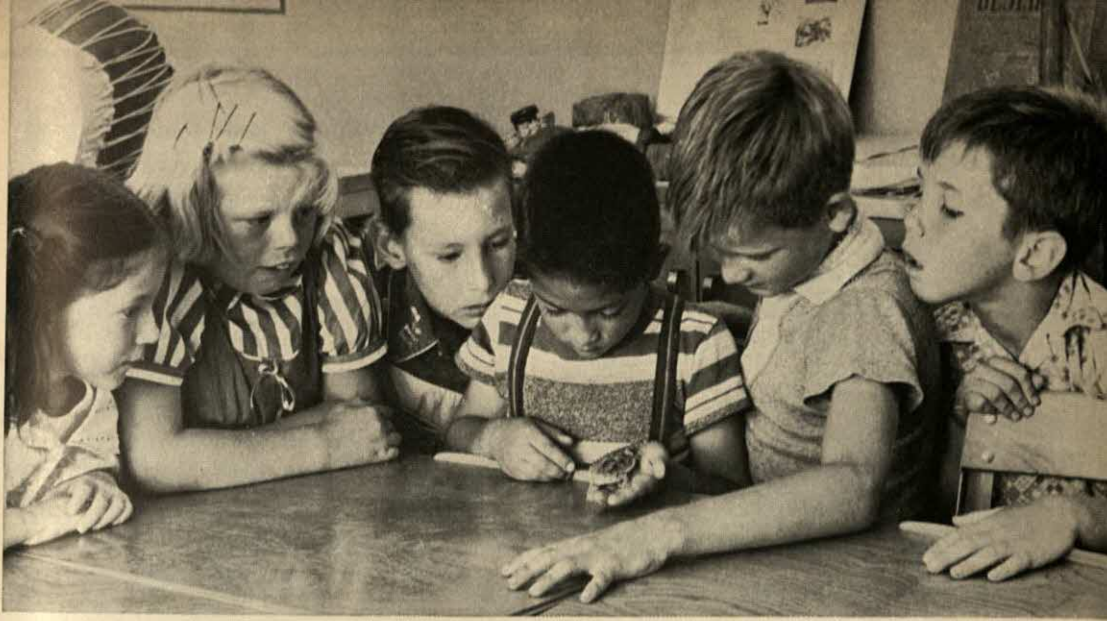


Fig. 8.2. If degree of fascination is any indication, these youngsters are getting some indelible impressions about a horned toad.

general, the processes involved, and the nature of the industry; and reading materials could provide considerable additional information. However, neither can convey an accurate impression of the heat of the great ovens or the delectable odors which are so much a part of a bakery.

CONCRETE EXPERIENCE IN LEARNING

You who have learned how to operate a motion-picture projector have an apt illustration of the importance of concrete experience. You can study a projector manual for some time without acquiring any operating skill. But by actually working with a projector under the guidance of an instructor you can learn quickly and easily. You "learn by doing."

Likewise, the natural science primary class acquires vivid and realistic impressions of how a butterfly emerges from its cocoon by watching the process in the classroom. Children in nursery school learn about getting along with other children from actual experience in getting along with them. Upper-grade pupils lay out a baseball diamond by using their mathematics; high-school social studies classes learn about their community by surveying it at first hand. Students learn important things about government by taking part in student council activities.

In many such ways teachers apply what they know about the importance of firsthand concrete experience in learning. If all learning could be of this type, school would indeed be a fascinating place for every pupil. One reason why firsthand experience is so effective is that it involves the whole child—his physical senses as well as his intellect (Fig. 8.2). It is a natural and satisfying way to learn.

MODIFIED SENSORY EXPERIENCE

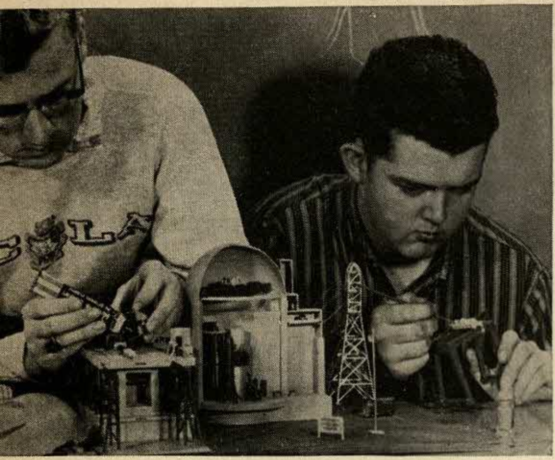


Fig. 8.3. This model of an atomic electric power plant is precise in every detail excepting radiation itself.

Yet we know that many things of a physical character do not lend themselves well to firsthand learning. You can visit the local waterworks and power plant without gaining much understanding of how the great pumps and generators work. You can get a thrill out of watching a giant Diesel locomotive move a heavy train without having any idea of how it operates. You can observe the moon for a lifetime without acquiring an understanding of its phases. Incidentally, how would you explain the phases of the moon to an intermediate-grade class?

The operation of some things like a pump, a generator, and an engine cannot be seen from the outside. You have to look at the interior to see how they work and even then their intricate construction may be baffling. The solar system can be seen to some extent but it is too vast to be understood from direct observation alone. Teachers need somehow to modify direct experience in such cases if they are to help their pupils learn efficiently. One way of doing this is by using models.

The satisfaction obtained from models has been translated into a rapidly growing industry—the manufacture of model kits. This industry is reported to have risen in volume of sales from $6 million in 1947 to over $100 million in 1960.[1] Model kits for everything from insects to atomic reactors are available, and parents as well as youngsters take to them with enthusiasm. Most are in precise scale and many are accompanied by a manual which contains useful information on the subject. By the time a student completes a model such as the one in Fig. 8.3, he is likely also to have acquired a substantial amount of related interest and knowledge in the process.

The social studies teacher is continuously faced with the need for bringing realism into the study of the far places of the earth—mountains, plains, deserts, and jungles; of peoples and customs of long ago; and of trade, in-

[1] Carson Kerr, "Modelmakers in a Tizzy," *Popular Mechanics*, December, 1960, pp. 82 ff.

dustry, agriculture, and government in the many sections of our own country. He has a great wealth of printed materials to draw upon and he uses them extensively, but he knows that he needs somehow to give added meaning to the words his pupils read. So he uses a great variety of pictures, films, maps, models, objects, field trips, and other devices which make the learning experience more real and lifelike.

The point is well expressed by Sternig in a discussion of pupil-prepared visual materials: "Learning from the printed page is only one method. It teaches best when related to something real in the actual environment which can be seen and handled and to which the printed ideas apply. All ideas are more easily gained and more securely held when learned through association with real things. This is a fundamental principle of education! It can hardly be considered a modern discovery but it is too often overlooked by teachers."[2]

CHARACTERISTICS OF EFFECTIVE MODELS

Models may be defined as *recognizable three-dimensional representations of real things*. The thing represented may be infinitely large, like the earth, or as small as an atom. It may be an inanimate object like a building, a monument, or a mine shaft; or it may be a living organism like a paramecium, an eye, or the human heart. The model may represent something as intricate as a turbojet, a nuclear-powered submarine, or a cyclotron, or as simple as a piece of wire. It may be complete in every detail or considerably more simplified than the original.

In the light of what we know about the importance of sensory experiences in learning, we examine several characteristics of effective models for teaching purposes.

1. *They are three-dimensional.*

Most objects around us have a third dimension; that is, they have depth or thickness as well as height and width. Effective models also have depth. This is one of their unique characteristics and it contributes significantly to their realism. If the third dimension is unimportant to comprehension, a model is probably unnecessary. In that case a picture or chart may serve as well or better.

The model of the eye in Fig. 8.4 is a case in point. Until a student can work with such a model, his concepts are inevitably somewhat vague regarding the actual shape of the eyeball, the position of the optic nerve, and the relationships between the shape, the remarkably adaptable lens, and the incredible small muscles that control its focusing.

[2] John Sternig, "Home-Made Visual Aids," *See and Hear*, April, 1946, p. 23.

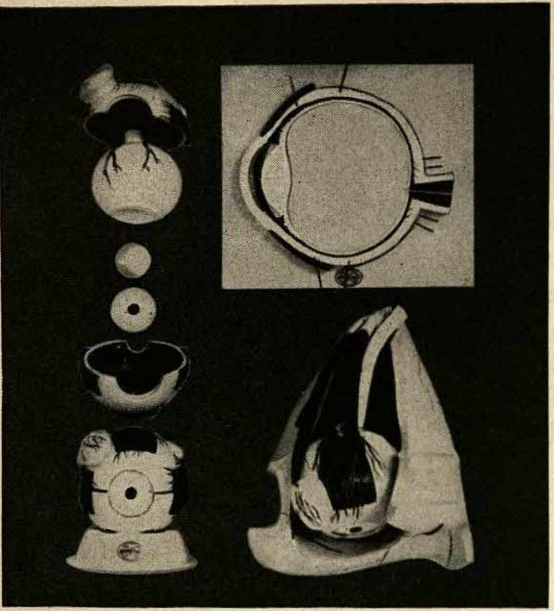


Fig. 8.4. A detailed model of the human eye which can be disassembled, studied in detail, and reassembled by the student.

2. *They reduce large objects or enlarge small objects to a size convenient for observation.*

We can see only a very small portion of the earth's surface even from an airplane. With a globe, however, we have a model that enables us to picture the whole earth without difficulty. Conversely, the greatly enlarged model of an anopheles mosquito shown in Fig. 8.5 enables these Indian children to better understand this enemy they must fight in the war against malaria.

Ideally, a model should be large enough to be seen readily by the whole class. Frequently, however, the cost of large models and the problem of storage space for them force a practical compromise in the form of smaller models than we would like.

3. *Models provide interior views of objects which are normally covered or otherwise invisible.*

A cutaway model of a human tooth reveals the layers of enamel and dentine and the nerve which otherwise would be difficult to visualize. The rapidly spinning parts of a generator, a steam turbine, or an automobile engine are completely enclosed, but a simplified working model with removable or cutaway sides makes it possible to see and understand how they work. A model like that in Fig. 8.6 will be helpful to an industrial arts teacher in showing details of frame house construction which are normally invisible.

4. *Nonessentials are removed so that fundamentals can be observed more easily.*

As you lift the hood and look at an automobile engine, the impression you receive is likely to be somewhat confusing and complex because of the considerable array of subsidiary parts, wires, tubes, and other paraphernalia that are required for a modern car. But such a look may be more revealing if you have studied a cutaway model of such an engine.

The electric motor, the jet engine, and the giant pumps in municipal pumping stations are other examples of complex mechanisms which can be readily explained with the help of simplified models.

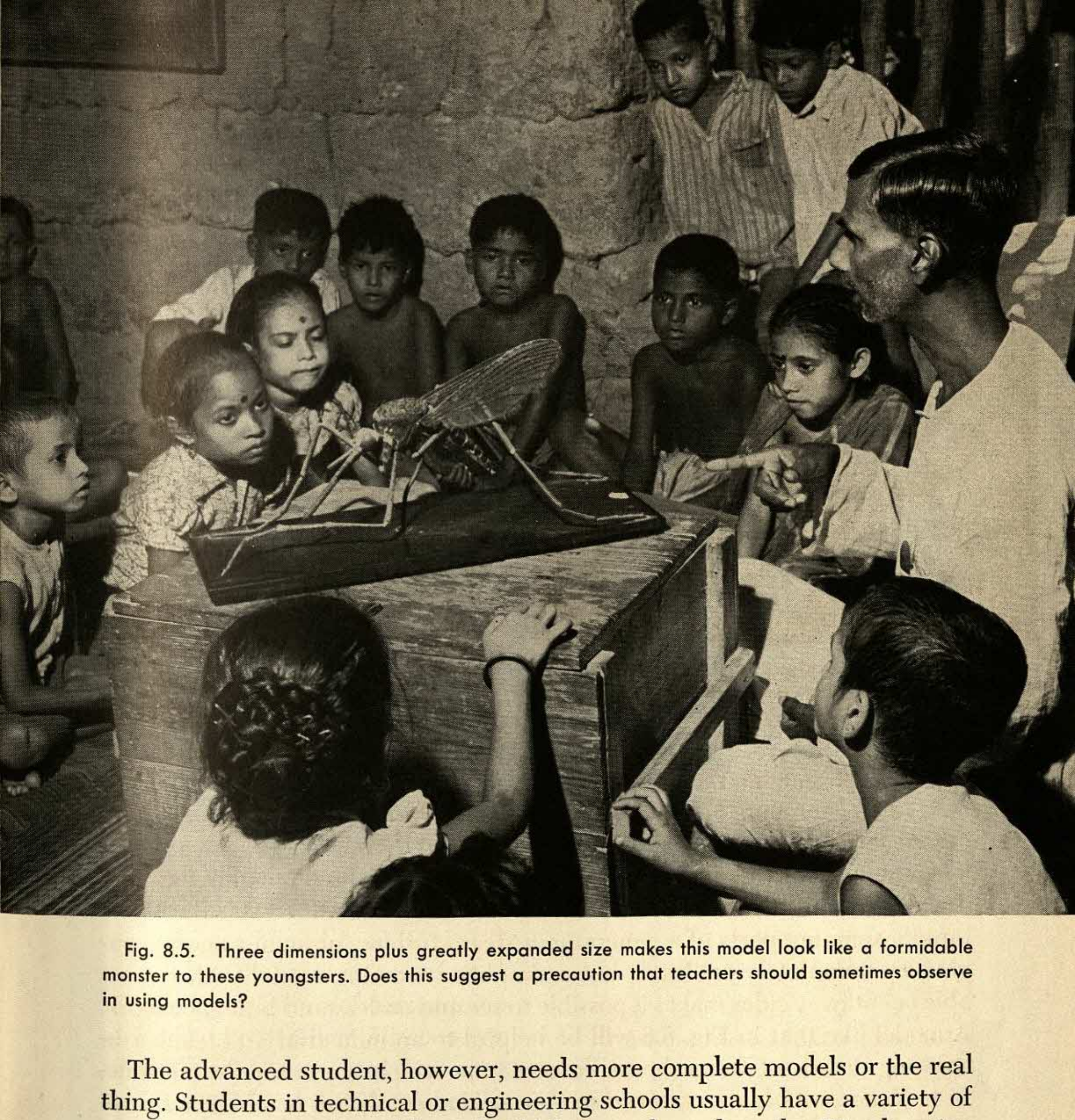


Fig. 8.5. Three dimensions plus greatly expanded size makes this model look like a formidable monster to these youngsters. Does this suggest a precaution that teachers should sometimes observe in using models?

The advanced student, however, needs more complete models or the real thing. Students in technical or engineering schools usually have a variety of cutaway engines and models with which to work, such as the Diesel engine in Fig. 8.7. Agricultural engineering schools test machinery of many types and frequently use cutaways and accompanying graphics for instruction. Equipment manufacturers also use this technique for dealer and customer training as well as for advertising.

5. *Models employ color and texture to accent important features.*

Two related instructional purposes are served by color. The first is identification of important or related parts, as in the engine models. The second is increased comprehension of function or operation. In addition, color serves to make models more eye-catching, interesting, and in many cases more attractive. This does not suggest that color should minimize other features of a model. Effectively colored models have a balance in color harmony and intensity which emphasizes the parts and functions that are important to comprehension.

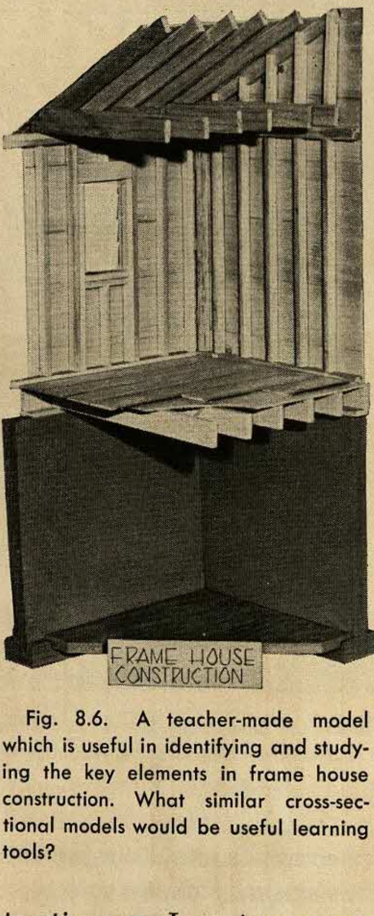


Fig. 8.6. A teacher-made model which is useful in identifying and studying the key elements in frame house construction. What similar cross-sectional models would be useful learning tools?

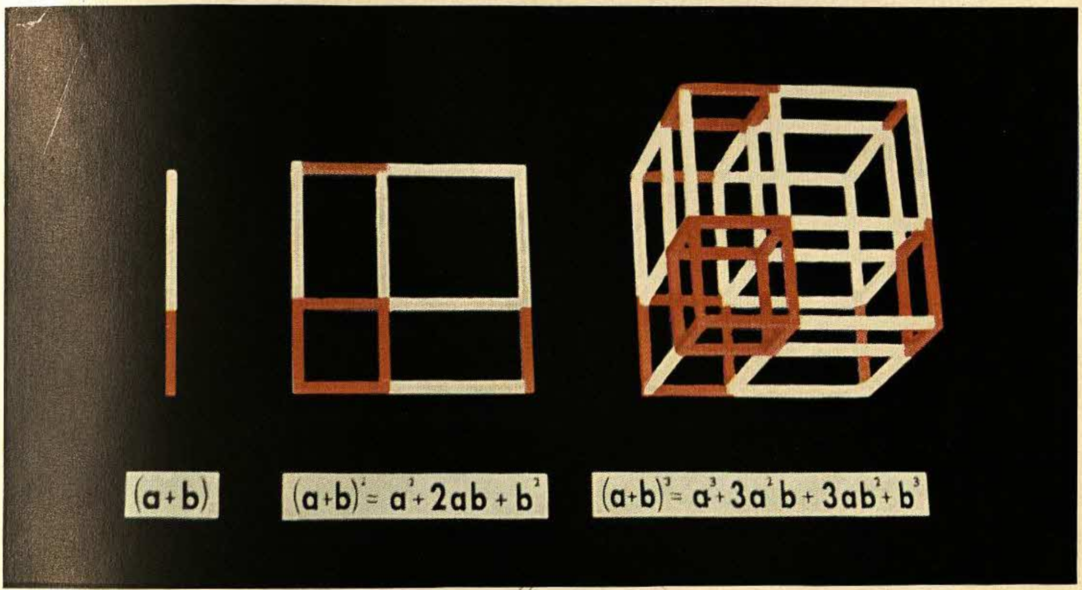
The role of color in models is illustrated in the plate facing this page. In the algebra model, color serves primarily to enable the student to follow visually what happens when algebraic sums are squared and cubed. In the anatomy model, color assists understanding mainly because identification is made more easily through its use.

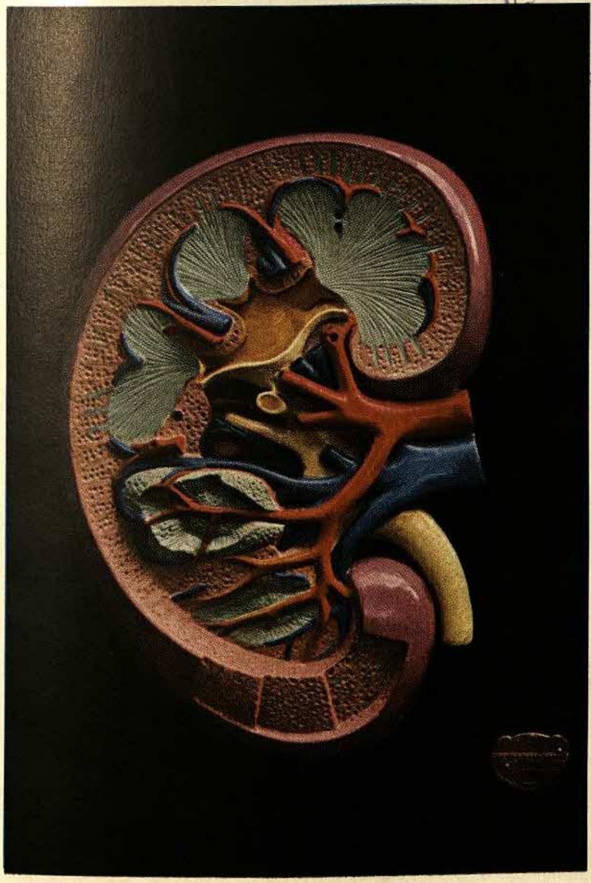
This role of color applies to models generally. Important and distinctive parts are colored so that each one stands out clearly. The colors may be natural (this is desirable on some anatomy models), but more often they are made brighter or otherwise changed for better visibility. Parts that are not essential for understanding are often in less conspicuous colors.

Bright or subdued surface textures are also used in order that complex models or engines may be more easily understood. The pistons and tubing may be chrome-plated for better visibility and attractiveness. Less important surfaces may be left rough or unpolished. Cylinder walls, other interiors of cutaway sections, and wiring may be polished or painted in contrasting colors so that operations can be easily traced.

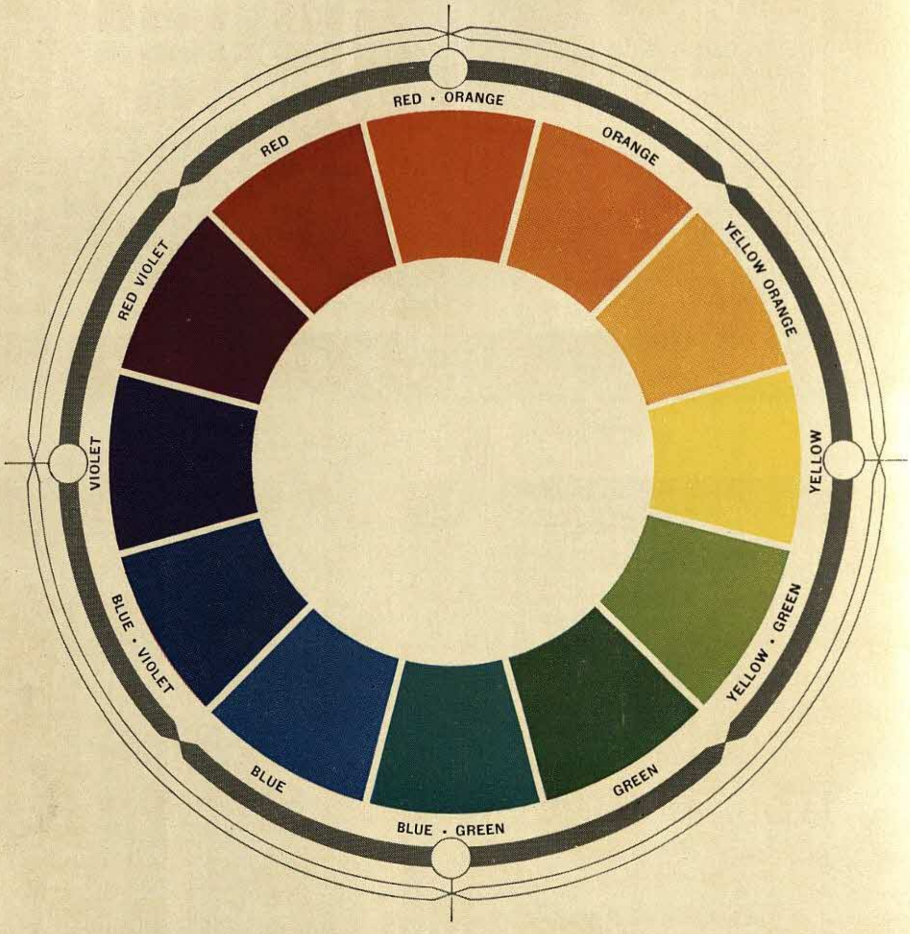
Opposite page: The type of color used varies with the purpose for which color is employed. When realism is called for, natural colors are used. To attract attention, as posters do, bright colors and strong contrasts are effective. The mood or atmosphere of a display or exhibit is made gay and cheerful with warm, bright colors, or quiet and restful with cool, soft hues.

Here is illustrated still another use of color—to emphasize and distinguish between important parts of models.


$(a+b)$
$(a+b)^2 = a^2 + 2ab + b^2$
$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$



U.S. NAVY
VANGUARD



The selection of color combinations for displays, exhibits, picture mountings, graphics, and models is simplified by using a color wheel. Such a wheel is made up of the three primary hues—red, yellow, and blue—and a series of in-between colors created by mixing varying proportions of the primary colors. Many additional color variations are possible, and the intensity of any given color may vary from dull to brilliant. Colors which go well together include (1) complementary colors, or those directly opposite each other on the color wheel; (2) triads, or any three colors equidistant from one another on the wheel; (3) split complementaries, which consist of any single color plus the two colors on either side of its complementary color directly opposite on the wheel; or (4) analogous colors, or colors having the same primary base (red, yellow, or blue) and commonly next to each other on the color wheel. Provided that colors which harmonize are used together, the principles illustrated by this simple color wheel may be readily applied in any problem of color selection.

6. The more useful models can be taken apart and put together again.

The value of models in instruction lies not only in their three-dimensional realism but also in the fact that they can be examined by touch as well as by sight. The model of the eye in Fig. 8.4 can be taken apart so that each part may be examined individually. Fitting each part back in its proper position gives the student a degree of familiarity with the structure of the eye which is difficult to achieve in any other way. Furthermore, the interrelationship of the several parts is made clearer.

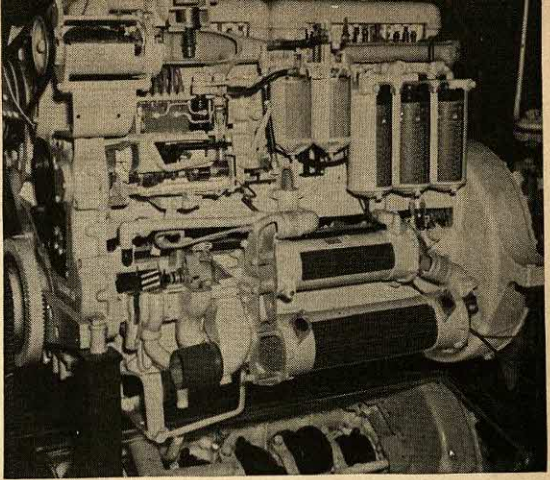


Fig. 8.7. Cutaway of a modern diesel engine showing all the moving parts and key construction elements. The mirror beneath the engine reflects the crankshaft, connecting rods, and bearings.

This section should not leave you with the impression that, to be useful in teaching, models must be complex and expensive. Many can be made rather easily from paper and papier-mâché. The science materials in Fig. 8.8, for example, are largely made from paper cutouts. The papier-mâché volcano erupts convincingly from a filmstrip can in its cone.[3] Students can make weather vanes, anemometers, and similar models which are suitable for their needs and provide greater learning advantages than similar purchased models.

OTHER THREE-DIMENSIONAL MATERIALS

Thus far in this chapter we have considered the importance of well-rounded sensory experiences in learning and some ways in which models can provide them when direct, firsthand experience is either impractical or impossible. We now consider several other types of three-dimensional materials which likewise provide opportunities for useful learning experiences. These are objects and specimens, mock-ups, and dioramas.

OBJECTS AND SPECIMENS

There is little point in using a model if the real object can be brought into the classroom and if it is not too complex for easy observation. You would

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[3] Ammonium dichloride crystals are used as fuel for the volcano. The crystals do not light easily; they burn slowly, spitting sparks a few inches, sending up a bit of smoke, and spreading dark ashes over the top of the cone as the eruption proceeds.

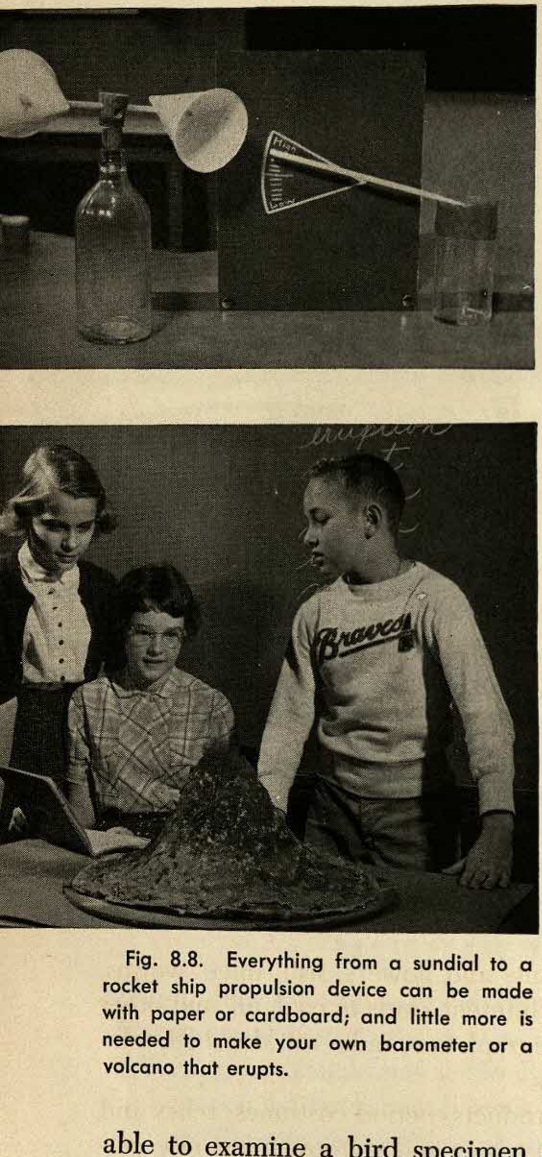

Fig. 8.8. Everything from a sundial to a rocket ship propulsion device can be made with paper or cardboard; and little more is needed to make your own barometer or a volcano that erupts.

not, for example, use models of Indian arrowheads, tools, and cooking utensils if you could secure the real objects. You might prepare a model of a wigwam and an Indian village if these were important elements in the social studies curriculum, but you would probably also have your pupils bring Indian beadwork, arrowheads, tools, utensils, blankets, and other crafts for display. Models and objects supplement each other in providing realism, authenticity, and interest.

Whereas a model is a recognizable three-dimensional likeness or representation of the real thing, *an object is the real thing.* These "things" are removed from their normal setting so that they can be brought together for study and analysis. This means that the object is not seen in its natural surroundings and therefore may appear less "real" than it does in nature. A mounted hawk in a display case filled with other mounted birds loses some of its realism even though it may be a good piece of taxidermy. Obviously, however, this limitation is much less important than the advantages of being able to examine a bird specimen at close range and in whatever detail desired.

Specimens and objects are similar though not identical terms. The principal distinction is based on the fact that specimens are typical of a class or group of objects, whereas objects do not have to be typical or representative to be classified as objects. *Specimens,* in other words, *are objects which are representative of a group or class of similar objects.*

There are significant advantages for learning in having objects and specimens available. For one, even though removed from their normal surroundings, they are real things. This fact tends to make the learning situation in which they are used more concrete, more authentic, and more interesting.

For another, detailed close-up study (Fig. 8.9) can be made of birds, insects, and other specimens which would be next to impossible even if the time and money were available to take classes to where these specimens are accessible in nature. Some are inaccessible in any case—living things in the sea and minerals from deep in the earth, for example.

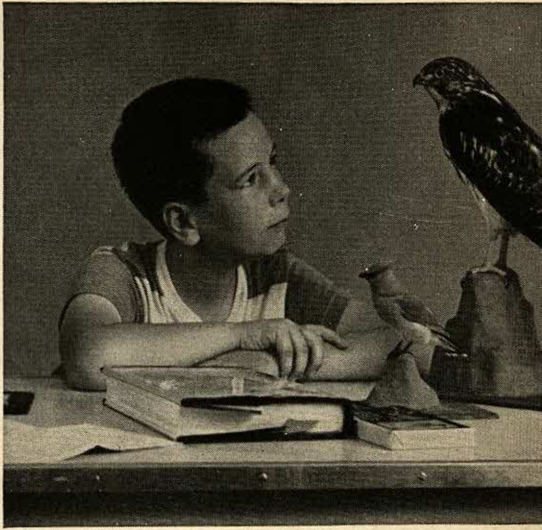

Fig. 8.9. These mounted birds are out where the students can examine them closely.

Finally, even though widely separated in nature, a collection of similar objects and specimens makes possible a comparison and generalization which would be impossible if each example had to be seen separately in its natural habitat. As Dale points out: "How long would it take you to gather from the world itself the essential information about minerals that is represented in a collection of rocks? It is simple enough to begin to classify, infer, and generalize with the collection before you. The same is true, of course, about any collection of objects and specimens."[4]

Many objects and specimens can be used to advantage in the classroom or laboratory, among them the following:

Science: Cocoons; rock collections; plants and flowers; fish, mice, worms, and other small animals (Fig. 8.10); different kinds of coal, oil, and other fuels; samples of ore; sea shells; a telegraph key, radio set, doorbell, telephone; dry cells and storage battery.

Social Studies: Locally manufactured products; period costumes; relics and souvenirs (as of political campaigns); coins and stamps; fuels; raw materials such as cotton, wool, flax, ores, and grains; early American utensils, toys, tools, furniture, spinning wheels, pictures, and books; and Indian relics used as in the project shown in Fig. 8.11.

English: Period costumes; clothing and relics; letters and manuscripts; musical instruments; fabrics; stage props; tapestries; speaker's podium and microphone; printing type and layouts.

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[4] Edgar Dale, *Audio-Visual Methods in Teaching*, Dryden Press, New York, rev. ed., 1954, p. 121.

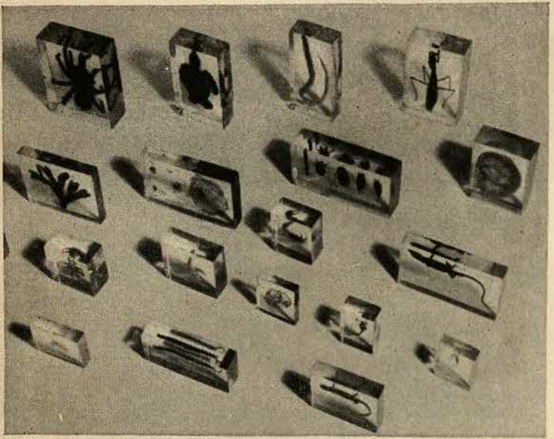
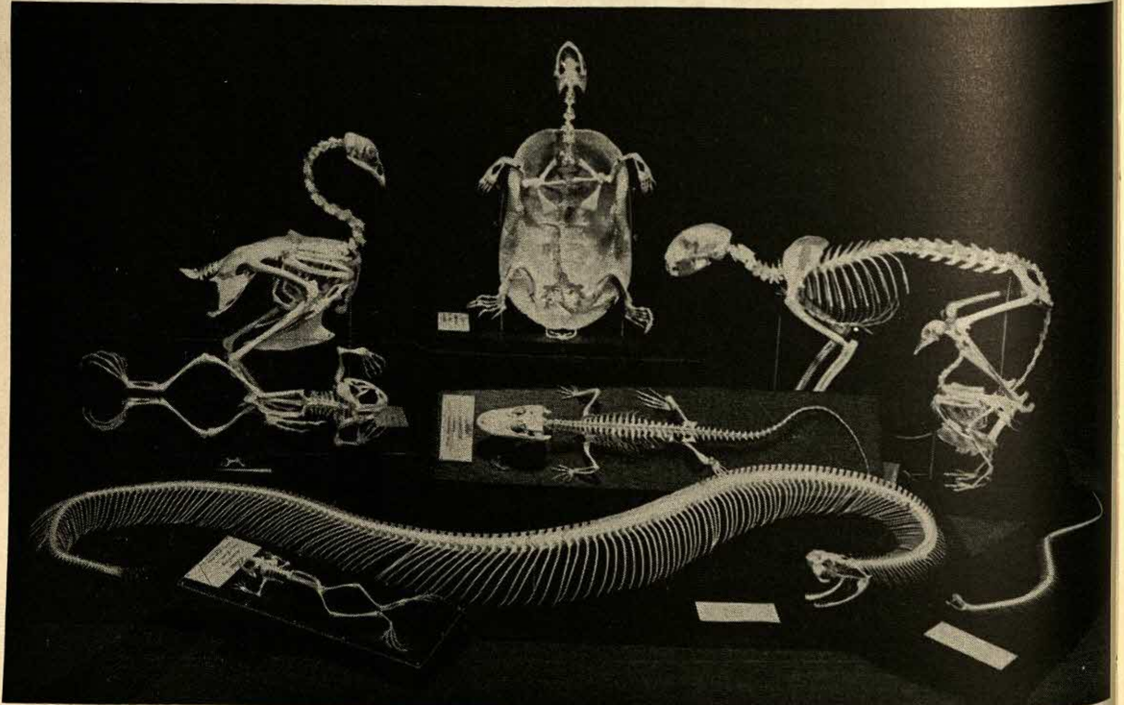


Fig. 8.10. We can collect and use specimens extensively provided the problem of organizing and taking care of them can be solved. Imbedding small and delicate specimens in clear plastic has largely solved the problem. Fragile skeletons like those in the lower photograph can be purchased in clear plastic boxes.

Mathematics: Slide rule, micrometer, vernier scale, and other measuring instruments; transit; sextant, compass, timepieces, and navigation charts; bottles and other containers for volume measurements; coins; drafting tools such as dividers, T squares, and triangles; and identical familiar objects for instruction in addition, subtraction, division, and multiplication.

Home Economics: Fabrics and sewing equipment; foods and utensils; period costumes to show trends in design; raw fibers such as cotton, wool, flax, and silk; wallpaper sample books; paint and papering tools; table settings.



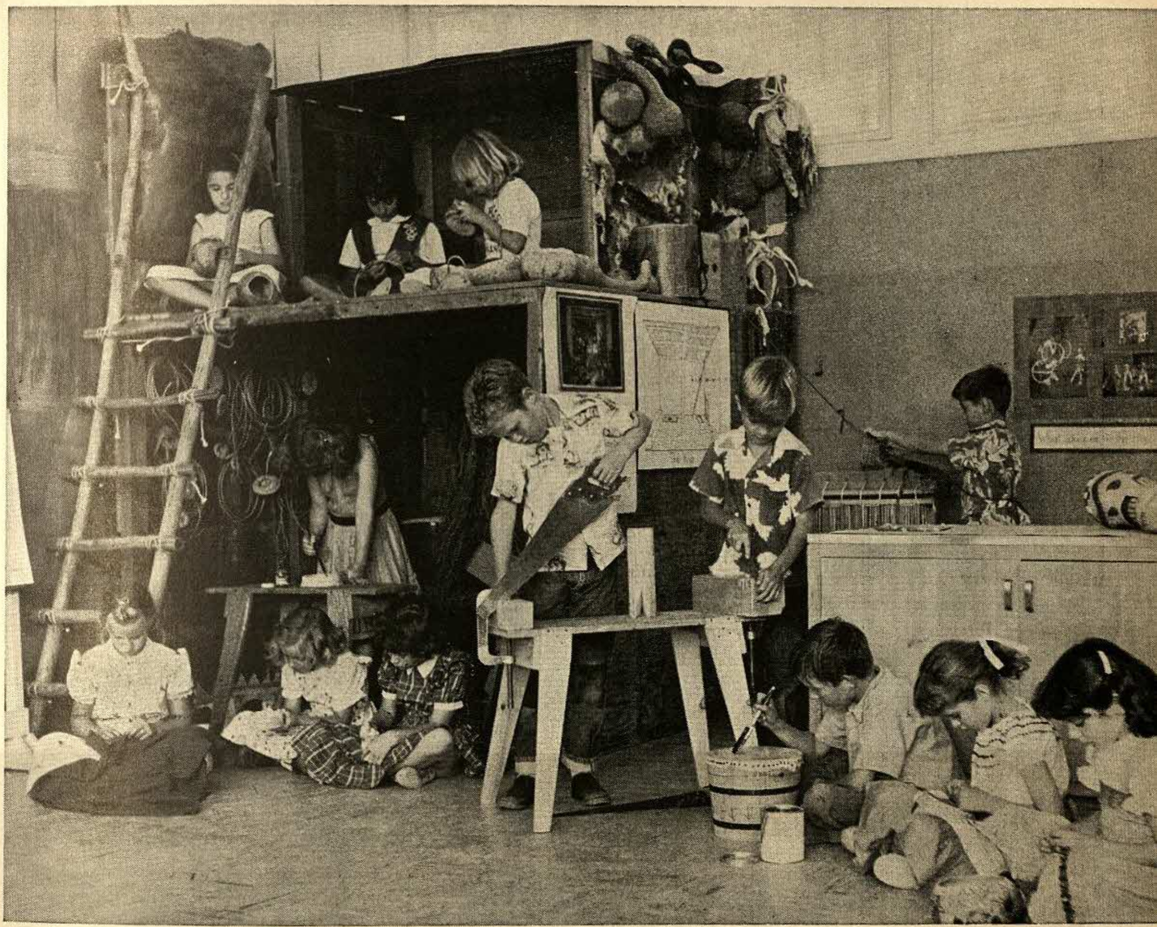
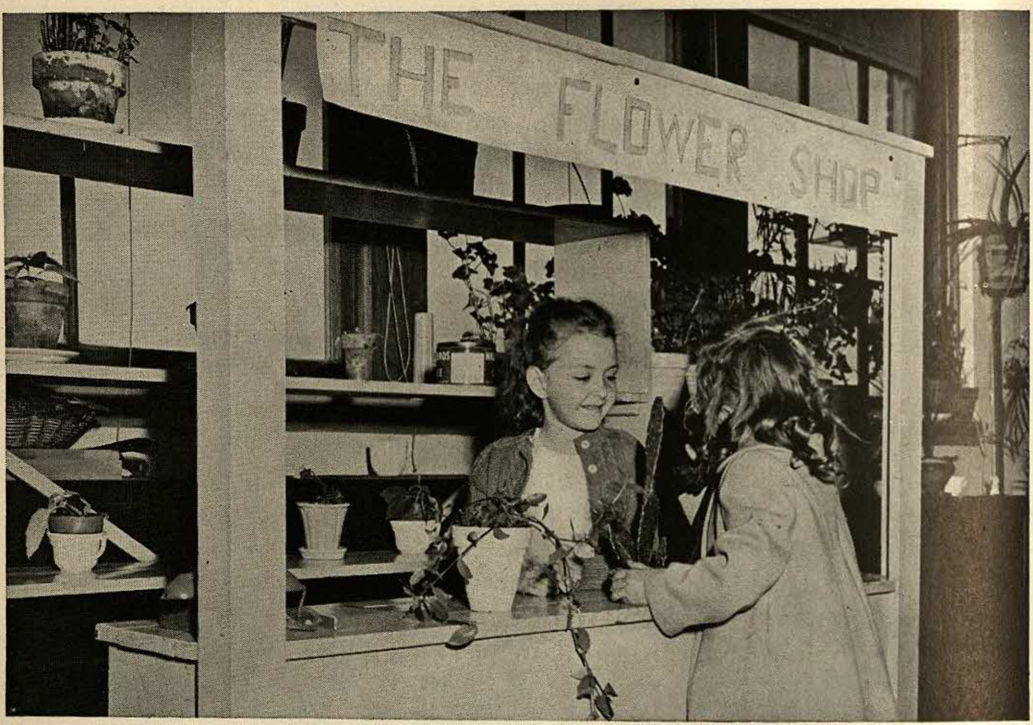


Fig. 8.11. What types of three-dimensional learning materials are in evidence in this Hopi Indian dwelling project? What kinds of learning activities are encouraged by these activities?

MOCK-UPS

A three-dimensional teaching device that has proved particularly useful in industrial and military training programs is the mock-up. The term "mock-up" suggests an imitation of a real thing—which in fact it is—but the imitation may or may not involve the similarity of appearance that is true of a model. In addition, in a mock-up some fundamental elements of the real thing are purposely eliminated in order to focus attention upon others. For example, an operable electrical system of an airplane may be laid out on a large panel so that trainees can become familiar with cables and connections that normally are concealed in the fuselage or wings of the plane.

A mock-up used in school is the clock face mock-up (Fig. 8.12) which



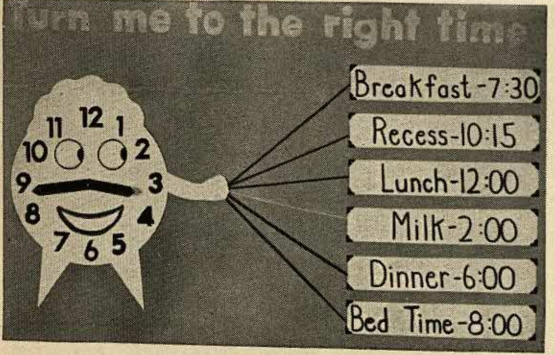


Fig. 8.12. Certain teaching and learning advantages are present in each of these mock-ups. Can you identify them? Are they worth the effort involved in constructing the mock-ups?

primary teachers use in helping pupils learn how to tell time. The clock mechanism, case, and frame are omitted, but the hands move just as they do in a regular clock.

A simple kind of mock-up is frequently used by kindergarten and primary teachers when they have their pupils build a grocery store, a flower shop (Fig. 8.12), a Santa's toy shop, or a railroad train out of blocks or orange crates. The purpose of these activities is to train the children in cooperative activity, reading readiness, or perhaps elementary number concepts. The devices are mock-ups in the sense that certain elements of the real experience are retained whereas others are purposely eliminated.

A useful mock-up for industrial arts classes is an electrical wiring and fuse-box installation that includes on one panel all the elements necessary for the lead-in wiring of a home. Placing these various elements on one panel makes it possible to show students the complete installation, parts of which are normally separated by a floor and walls. The student can see quickly just how the installation should be made.

Industries use mock-ups for streamlined demonstrations of steps in manufacturing processes, for analyzing possible new plant layouts, for orienting new employees regarding the interrelationships of their work with that of others, and for self-testing demonstrations of various types.

Mock-ups have many applications in training, but none is better known (or perhaps more widely appreciated) than the device for training airplane pilots known as the Link Trainer (Fig. 8.13). Developed initially for fighter pilots, the Trainer is used extensively by commercial airlines not only for training pilots for new planes but also for providing refresher courses for experienced crews. Various flying problems and emergencies can be simulated in the Trainer at no risk to passengers, crews, or planes.

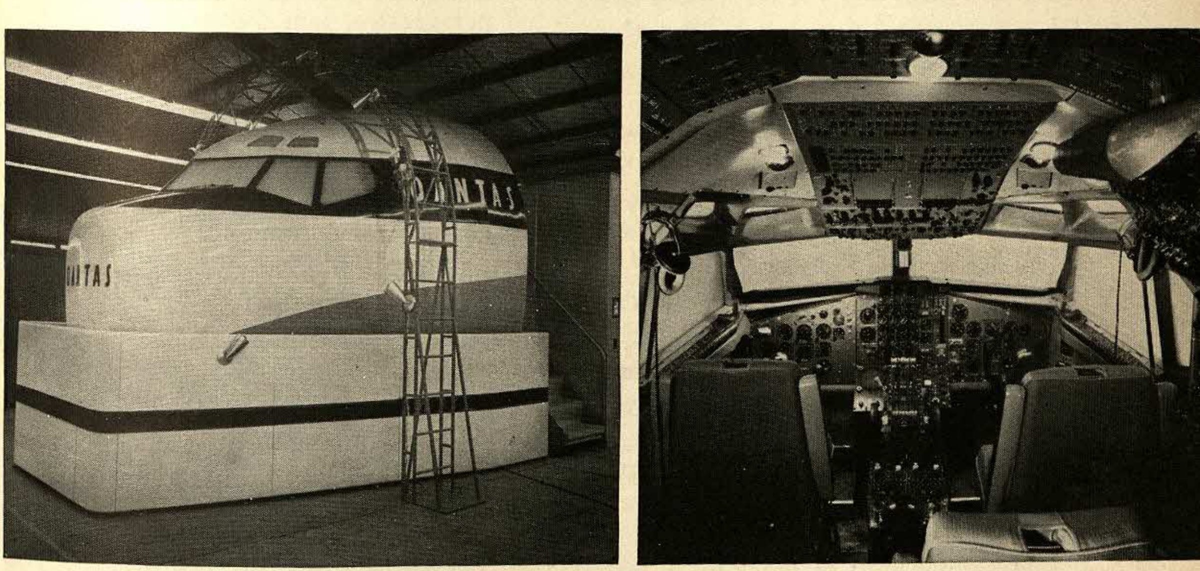


Fig. 8.13. One of the better-known applications of mock-ups is in flight crew training. This is the business end of a 707 jet, together with an exact replica of the cockpit—the current version of the famous Link Trainer. Flight conditions are simulated closely, including the sounds and movements of flying, and also response to the controls. An operator in the control booth behind sets up any kind of problem and the crew's reactions are recorded electronically.

DIORAMAS

One of the most fascinating forms of three-dimensional materials is the miniature diorama. Its universal appeal is well known to everyone who has seen dioramas in museums, advertising displays, or classrooms.

A diorama is a three-dimensional scene incorporating objects, figures, and backgrounds in perspective. The scene is usually set up on a miniature stage (Fig. 8.14). The objects in a diorama, such as figures, buildings, and trees, are seldom made to a scale. A building is made to look smaller at the far end in order to exaggerate depth. As you look down the street, for example, people and buildings far away appear to be smaller than those close at hand, and the street itself seems narrower. This illusion, called "perspective," is fundamental to any representation of depth. (See color plate facing this page.)

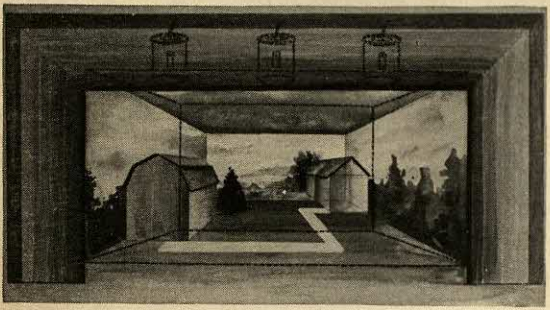


Fig. 8.14. The layout of a diorama is shown here. Note the tapering walls, ceiling, and buildings which help create the illusion of depth.

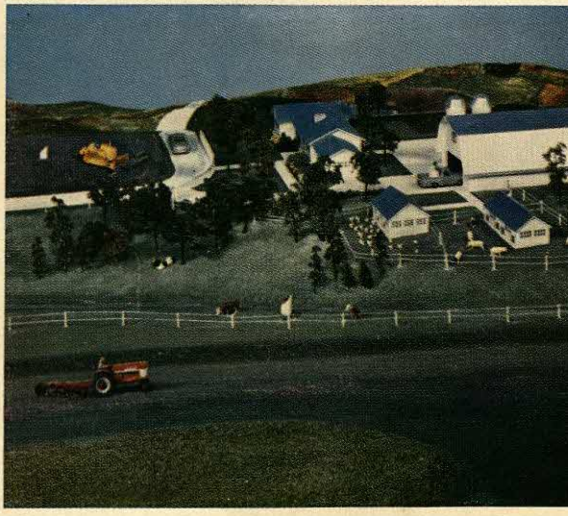
With small figures and exaggerated perspective, you can give an effect of considerable depth in a relatively small space. This illusion, well carried out, gives the diorama striking vividness and realism.

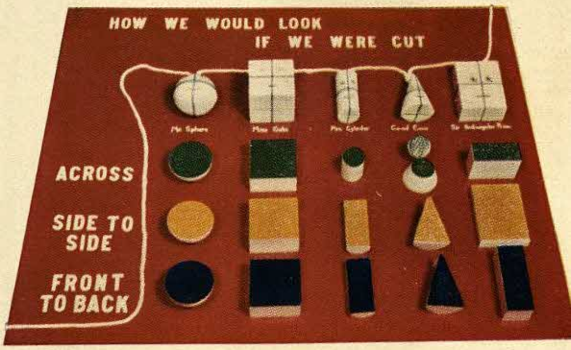
Modern museums make extensive use of dioramic exhibits to show scenes involving distant places and historical periods. Teachers in schools in the vicinity of such museums are well aware of their vast educational potential. The Milwaukee County Museum, the Los Angeles County Museum, and the well-known Cleveland Youth Museum are among those which are doing outstanding work in coordinating historical and current materials with school programs by means of dioramas.

Even though such museums are not available to most schools, the effectiveness of the diorama need not be lost. Good dioramas can be constructed by the students from easily available and inexpensive materials.

Opposite page: Color adds materially to the "before" and "after" soil and water conservation exhibits at the top, and to the study display at the right of the middle row.

The use of color to add realism is particularly important in dioramas because here every effort is made to give the illusion of reality in miniature. At the left of the middle row is a student diorama of the Globe Theater; the diorama of Costa Rica at the left of the last row was made by prospective teachers at the University of Costa Rica. The diorama to the right of it shows the ancient cliff dwellers at Mesa Verde National Park in Colorado.





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Leaves cut from paper and dipped in stained wax are good for some kinds of tropical foliage; fine sawdust stained green will do for grass; the furrows of a plowed field can be imitated by running a comb over a bed of wet clay; and pieces of green rubber sponge do very well for shrub and tree foliage. Detailed and well-illustrated instructions for constructing dioramas are given by Jenkins.[5]

USING THREE-DIMENSIONAL MATERIALS IN TEACHING

CLASSROOM USE

A high-school history teacher whose class was visited by one of the present authors on several occasions said: "I would hardly know how to teach history without using the models and objects we have collected over the years I have taught in this school. They seem to help my pupils actually to relive the events and times we are studying. One of the things that pleases me greatly is that many of our former students who have graduated keep coming back to see how our collection is growing."

One had only to watch this teacher at work for a short time to appreciate that her pupils' unusual interest in things historical stemmed in large measure from her own genuine and infectious enthusiasm. She was an excellent teacher.

But her classroom itself also helped to bring history alive. Objects and models pertinent to the lesson were much in evidence. She utilized pictures and old prints liberally and there seemed to be an interesting story about each one. Objects were discussed in context and examined at close range; all but the most fragile were handled by the students. When questioned about damage and loss of articles, she said that there was virtually none; the students were proud of their collection and treated it accordingly.

Selection. By this time you will have sensed that objects and models, like other audiovisual materials, should be used when they can make a unique contribution to the lesson. Three-dimensional materials are more real to the student than pictures because they have depth and substance. They can be seen and handled, and sometimes smelled or tasted, thus making for a more complete sensory experience.

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[5] J. W. Jenkins, "Let's Make a Diorama," *See and Hear,* November, 1948, pp. 36–37, and January, 1949, pp. 35 ff.

Opposite page: Natural colors are important in the study of anatomy, as is clear in this remarkable exhibit of the human heart. People walk right into the model, see the heart valves function, and hear the amplified beat.

Thus in learning situations where the third dimension is important, a suitable model, object, specimen, mock-up, or the real thing should be used if feasible (Fig. 8.15). If nothing is available, the possibility of constructing a simple model or diorama is worth considering.

For an English teacher it may be a model of the Globe Theater made from cardboard. For a mathematics class it may be a set of cubes, some spools on a string, a nest of tin cans, or a shoestring and a circle of wood for demonstrating the meaning of π. Stockades, Conestoga wagons, and wigwams are practically standard equipment in the social studies classroom, and most of them can be made by the pupils. With a little help, pupils can easily construct a loom or an oil derrick (Fig. 8.16).

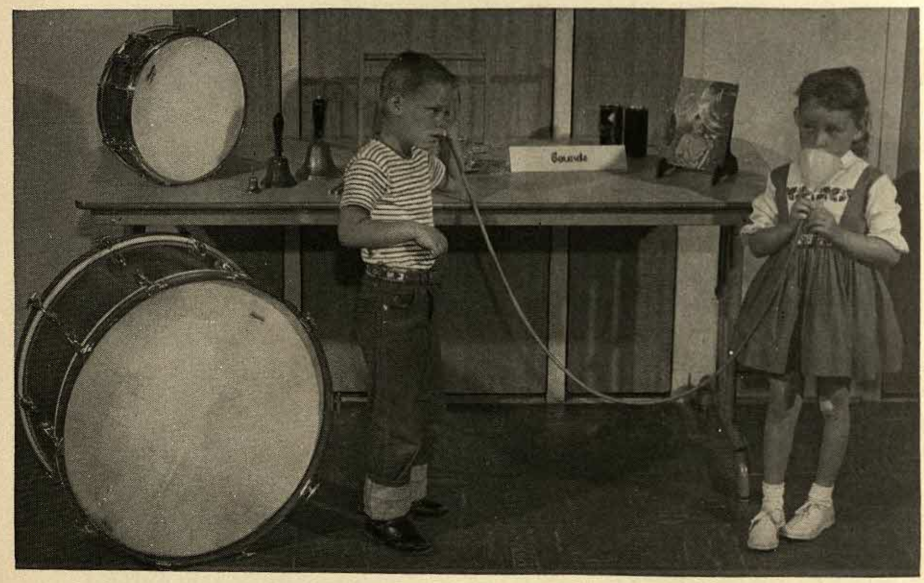


Fig. 8.15. Models are unnecessary when the real thing is available and suitable. No strangers to sound, these first-graders appear to be getting a new perspective about it.

In all such situations a question to be answered is whether the need is important enough to warrant the time and effort involved in making a model. The same question applies, of course, to collecting specimens and preparing displays. It cannot be answered categorically or in terms of subject-matter learning alone, because, as every experienced teacher knows, the values of such activities to pupils in terms of cooperative experience, individual recognition by the group, and satisfaction in accomplishment may at times far outweigh the value of the information acquired.

Principles of Use. Models have a natural appeal which suggests some ideas regarding their effective use in instruction.

1. *Make certain that all the pupils can see.* Ideally every model would be large enough to be seen easily by everyone in the class at one time. While this is often impractical because of such factors as space, cost, and storage facilities, such materials should be large enough for all to observe the general features, closer examination being left for group and individual study (Fig. 8.17).

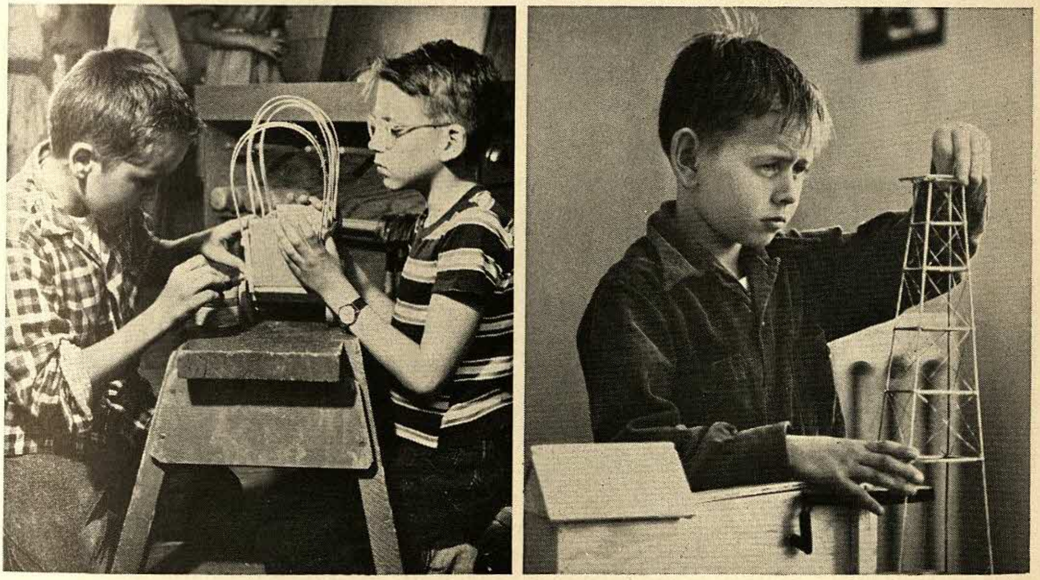


Fig. 8.16. Making a model can be busy work or creative learning. What educational goals are being sought with these two model-making projects?

2. *Use models along with other materials.* When you use a model of a flower to explain pollination to a biology class you may wish to use a large wall chart for details so that all the class can see it readily. You work back and forth between the two to establish clearly the relationship between parts and functions. At the appropriate point you may also show a sound film which uses animation to visualize the fertilization process. You will doubtless bring in some real flowers for concrete application of the information acquired.

In a word, as with other visual and auditory materials, for maximum bene-

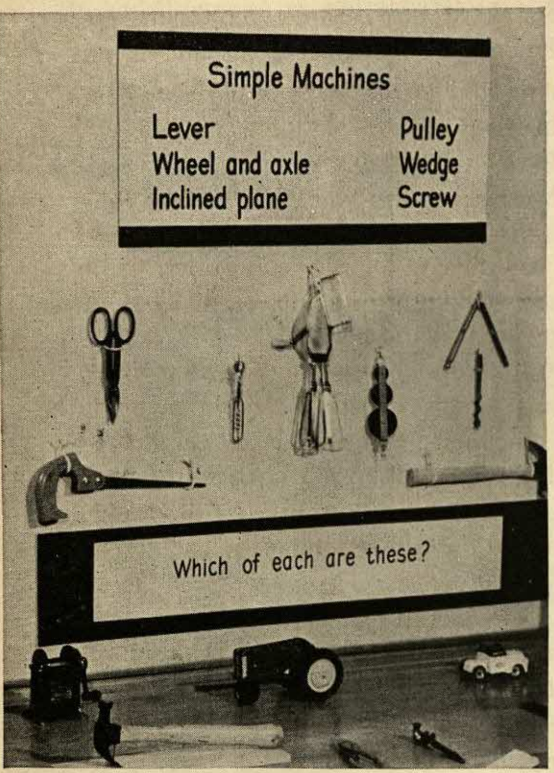


Fig. 8.17. Objects and models are put to good use in this display for a unit on simple machines, probably at the cost of considerable effort. Would good pictures of these materials do as well? Why or why not?

fits you use models or objects as part of a *team* of materials. Each part of the team is chosen for the distinctive job it can do as well as for its contribution to the overall effort.

3. *Be sure that correct concepts of size are given the pupils.* One of the dangers in using models is that the pupils may get distorted ideas of actual size unless care is taken to guard against this in teaching.

A curator in the Milwaukee County Museum told of a case which illustrates this point. An intermediate class studying some Polynesian exhibits was particularly interested in a small-scale diorama of a native village. Actual coins used by the natives were included in the exhibit. Since the people in the diorama were only a few inches tall, some of the crude coins were nearly as large as the natives themselves. In evident perplexity a number of pupils asked how the natives managed to carry their money around with them.

One way of emphasizing correct size concepts is by showing the actual object along with the model. Another is by making comparisons with familiar objects. For example, a picture of a large turbine in a power plant can be helpful when used with a small model if a workman is shown in the picture to indicate the relative size of the giant turbine.

4. *Arrange for firsthand examination of three-dimensional teaching materials.* Since one of the major appeals of objects, specimens, models, and mock-ups is their three-dimensional realism, this appeal should be used to stimulate curiosity, interest, and imagination (Fig. 8.18). Unlike pictures, such materials appear differently from every angle and hence should be examined from various points. One of the best ways of providing for this is to have students work directly with the materials.

Further, since the use of models offers an opportunity of providing well-rounded sensory experiences, there is good reason to let the students handle a model as well as look at it. To do so makes the experience more concrete, tangible, and memorable to the learner. As was said earlier, the models and specimens which are too fragile or too small to permit handling can be mounted in clear plastic (Fig. 8.10), thus making detailed examination possible from all angles without damaging the specimen.

Anyone who has seen intermediate-grade pupils making their own models, or junior- and senior-high-school pupils concentrating on collections of insects will have little question of their ability to handle models and specimens with care. There is little reason for having these valuable tools of instruction if the students are not allowed to handle them.

5. *Show only such models and other three-dimensional materials as apply to the work at hand.* Storage problems frequently lead to classrooms being cluttered with all manner of objects, specimens, and models. At the proper time they are hauled down, dusted off, used, and then put back on the shelf for another semester or year. Too often these collections are in full view of the students at all times, distracting attention and lessening their effectiveness when used for instruction.

Although some materials like aquariums, terrariums, and globes lend themselves well to continuing observation and interest as part of the classroom environment, the great majority of teaching materials are unsuited for this purpose. The enterprising teacher sees to it that they are stowed away out of sight until the psychological moment arrives for using them. He realizes that their interest value is thereby greatly enhanced and that attention can be focused more effectively if unrelated materials are not visible.

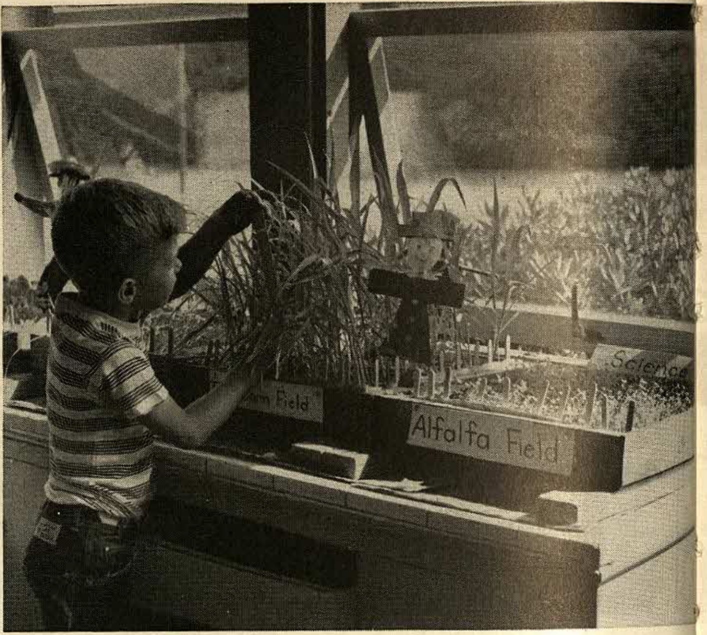
Like a good merchandiser, the teacher knows that he must catch and hold his pupils' attention before he can "sell" his ideas effectively. Some teachers cover the glass in their classroom storage cabinets with colored drawing paper, others ask the art department to use this space for simple, appropriate designs which have a decorative effect but are not distracting. When no cabinet or other storage space is available in the classroom, cartons or boxes may be used to store three-dimensional materials between uses.

USE IN DISPLAYS AND EXHIBITS

Aside from the classroom itself, three-dimensional materials are most widely used in educational displays and exhibits. Although we tend to think of displays and exhibits primarily in connection with retail selling, museums, trade shows, and fairs, they have many useful applications in schools as well.

Most schools have Parents' Nights, Hobby Shows, or annual exhibits of some kind. Vocational schools and technical high schools make regular use of displays to show the work done by various departments. Most of the

Fig. 8.18. These two pictures illustrate several principles of good use of three-dimensional materials. What are they?



newer elementary- and secondary-school buildings have built-in display cases in the corridors for educational exhibits during the school year. In all of these, three-dimensional materials play a prominent part.

Display and Exhibit Defined. Though used interchangeably, the terms "display" and "exhibit" differ in meaning. The word "display" is used widely to denote newspaper or magazine layouts, posters, painted signs, and arrangements of merchandise as in window displays.

An exhibit, on the other hand, is primarily educational in function and nature. A further distinction is that three-dimensional materials are used more extensively in exhibits than in displays. Commercial firms regularly present outstanding educational exhibits at fairs and various trade expositions.

In summary, *a display is an arrangement of primarily flat materials in a conspicuous location, designed to interest, influence, and possibly inform those who see it.*

An exhibit is an arrangement of primarily three-dimensional materials designed to inform the observer about a subject of educational significance. Note that an exhibit may include posters, charts, graphs, and pictures; it may incorporate such devices as motion pictures or recorded lectures. Its essential physical characteristic, however, is a visual impression of realism created in substantial measure by three-dimensional rather than flat materials.

Preparing a School Exhibit or Display. How do you go about preparing a display or exhibit? (See pages 478 and 481 for Source Lists of display and exhibit materials.)

1. *Establish your purpose.* As in any other educational endeavor, you must know first *what* you wish to accomplish and then plan *how* it is to be done. Bruno Gebhard of the Cleveland Museum of Health gives this sound advice:

> Exhibits are too often made with a minimum of clear thinking and planning. A vague idea is not enough and even a splendid one needs much detailed work. You would not dare to face a microphone without a script or film a motion picture without a scenario. Treat your exhibit with equal respect. Put down its purpose in writing; describe the basic idea; be specific about the facts and figures to be used; the technique by which they will be shown. Your manuscript should also include complete copy. . . .[6]

2. *Make a plan.* Your second step is to carry the plan to the "blueprint" stage. Work it out on paper, showing measurements, design to be followed, color scheme, lettering, and placing of materials. The art teacher can help you here, because effective exhibits and displays always incorporate sound art principles. One of these involves simplicity, another design or arrangement, and a third color.

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[6] Bruno Gebhard, "How to Make and Use an Exhibit," *Exhibits—How to Plan and Make Them,* National Publicity Council for Health and Welfare Services, New York, 1946, p. 5.

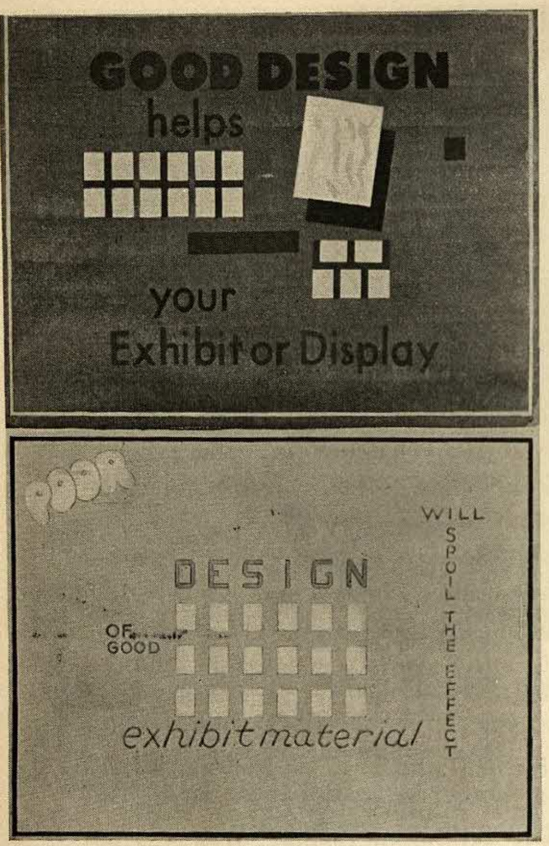

Fig. 8.19. The same principles of arrangement apply to both exhibits and displays. Here are a few cues that may be helpful.

As to *simplicity,* McDougall has a suggestion worth remembering: "Poster and display work go hand in hand. A poster must not be loaded with copy. The poster and display must convey one central idea. If you have more to say, put it in another exhibit."[7]

The *design* itself should be simple. Basically designs are merely arrangements of various lines which lead the eye where you want it to go and at the same time produce a pleasing overall effect. Notice the effect of the good and bad arrangements in Fig. 8.19.

Color is an important factor in any display or exhibit. It can be used for such purposes as attracting attention, emphasizing boundaries, indicating classifications and groups, and providing effective backgrounds for materials and lettering. Along with lighting and good design, color is regarded as fundamental by professional exhibitors such as the New York Museum of Science and Industry: "From our experience here at the Museum we have found that the three part formula of sound architectural design, proper use of illumination, and good color effects, is the first essential of good exhibition practice."[8]

The color wheel (see plate facing page 217) is helpful in working out effective color harmony. In any typical color wheel the colors directly opposite each other are complementary and work well together. Likewise, any three colors equidistant from one another on the wheel provide a pleasing three-color harmony. The artist varies these combinations by adding black to one of the colors (muting) or adding some white (softening).

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[7] Kenneth L. McDougall, "Tips for School Exhibitors," *Minnesota Journal of Education,* May, 1950, p. 23.

[8] *Exhibition Techniques,* New York Museum of Science and Industry, 1940, p. 19.

Some colors—reds, oranges, and yellows—are cheerful, warm, conspicuous. They are normally associated with fire, danger, excitement. The so-called cool colors, on the other hand—green, blue, and purple—are more soothing and restful. They are commonly used to represent grass, water, and sky.

Color studies show that blue, green, and red in that order are the most preferred; orange, red, and blue have the greatest attention value; and yellow, green, and orange have the greatest luminosity or brightness.

Lettering likewise calls for color "know-how." As Gilbertson says: "Whether measured in terms of speed of reading or distance that words can be read, the most important factor is the contrast in brightness between color of printed letters and background. The color combinations that can be read most easily at the greatest distance are listed in order as follows: Dark blue on white background, black on yellow, green on white, black on white, green on red, red on yellow, and red on white."[9]

Lettering for displays and exhibits in schools can be done in several ways. Hand lettering put in by capable students or teachers is distinctive and particularly desirable for large headings. Cutout plywood letters made in the manual arts shop are excellent. Three-dimensional letters made of cardboard and plaster are highly effective; they can be purchased commercially. Gummed letters in various sizes and colors are available at low cost. (Sources of these and other exhibit materials are listed on pages 478–481.)

Lighting is a dominant factor in any exhibit or display. It serves not only to focus attention but to bring out the effects that are created with design and color. Artificial light is often better than daylight because the latter varies and is unpredictable. Furthermore, very strong daylight tends to reduce contrast and thereby weakens the character of a display. A professional exhibitor brings out the point in this way: "The advantages of artificial light are quite simply illustrated by comparing the daylight appearance of a well appointed shop window with the much brighter impression it creates at night. The importance of this concentration of light is very great where the task is to draw and hold attention."[10]

The use of expensive and intricate lighting for school exhibits is neither practical nor necessary. The fixtures in the average school that has an auditorium stage can be used to advantage for special occasions. A few spotlights and a floodlight or two will do much to add interest to an exhibit

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[9] H. W. Gilbertson, in *Educational Exhibits—How to Prepare and Use Them,* U.S. Department of Agriculture, Miscellaneous Publication No. 634, Government Printing Office, Washington, 1948, p. 19.

[10] *Exhibition Techniques,* p. 68.

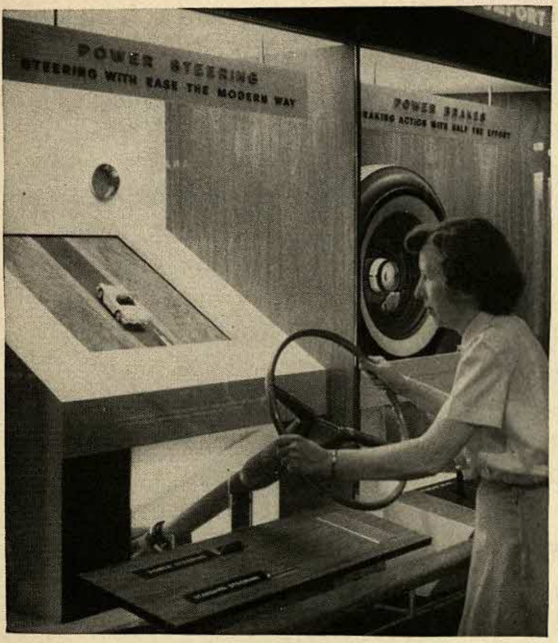

POWER STEERING
STEERING WITH EASE THE MODERN WAY
POWER BRAKES

Fig. 8.20. Where participation can be worked into an exhibit, it never fails to increase interest. The little car responds precisely to the steering wheel, which can be switched from manual to power steering to convince the dubious.

that extends around a gymnasium. When exhibit cases are located in corridors, a fluorescent fixture concealed in the case increases the attention-focusing power of the materials displayed. If you want to experiment, you can get pleasing effects by using colored gelatin sheets over the light. Since fluorescent light is "cold" light, no danger of fire is involved.

Display boards located on inside corridors or in dark corners of classrooms need lighting to be effective. A shaded fluorescent fixture at the top of such a board is a good way of lighting the display surface evenly.

3. *Provide for viewer participation.* The most effective exhibits frequently involve the viewer in some type of participation activity. Exhibits in the Chicago or New York Museum of Science and Industry, in which the viewer pushes a button or turns a knob to make something happen, are extremely popular. Anyone who has visited the American Museum of Atomic Energy at Oak Ridge, Tennessee, will not easily forget the part of the tour in which he can have a dime bombarded with neutrons so that it activates a Geiger counter, after which it is returned to him encased in a souvenir plastic disk. Similarly, driver-demonstration devices like the power steering exhibit in Fig. 8.20 are always popular.

The value of viewer participation in an exhibit is based on familiar principles of learning. Experienced teachers know that pupil activity is closely related to learning and to retention of what is learned.

4. *Carry out your plans.* Planning is the key to a good exhibit or display. It takes time but is well worth it. When you put your plan into effect you can proceed with assurance and a minimum of waste motion.

Your students should work with you on the planning from the beginning in most instances; with a little help here and there they can carry much of the load. Helping to put on an exhibit offers another good opportunity for valuable learning above and beyond significant gains in factual information. The greatest profit for all, however, is derived from an exhibit which is planned and executed in terms of sound and effective educational principles.

SUMMARY

Much of the effectiveness of direct concrete experience in learning comes from the fact that such experience involves a well-rounded use of the physical senses. Although firsthand experience is impossible or impractical in many teaching situations, important segments of reality can frequently be brought into the classroom by means of models, objects and specimens, mock-ups, and dioramas.

These three-dimensional materials can help to make the learning situation more real, lifelike, and interesting to the student. Furthermore, they are frequently an improvement on reality itself. A model of the solar system or of a one-celled animal, for example, reduces the vastness of the former and enlarges the microscopic proportions of the latter to a size which can be seen and studied. Cutaway models provide interior views of objects which ordinarily cannot be observed. Among their other useful characteristics, models have the realism of three dimensions, they are usually simplified, important features are made to stand out clearly, and many models have removable parts.

Models are defined as recognizable three-dimensional representations of real things; objects are the actual things. Specimens are objects that are typical of a class or group of objects. A mock-up is similar to a model but is distinguished by rearrangement and condensation of essential elements so that they can be studied more readily. A diorama is a three-dimensional scene made with miniature objects and backgrounds.

In order to use three-dimensional teaching materials effectively, it is of primary importance that they be seen clearly and examined from various angles. Students should accordingly be permitted to handle and work directly with them whenever possible. The instructor must be careful to avoid giving the class distorted size concepts when models are used. As in all effective teaching, he should combine pertinent materials in terms of lesson needs. In general, three-dimensional materials should be stored out of sight when not being used for actual instruction.

Displays and exhibits are other highly effective means of using three-dimensional materials. Although good educational exhibits require careful planning and the application of artistic principles governing arrangement, color, and lighting, they can and should be cooperative projects in which the students participate actively. Here too, as in the construction of dioramas and the use of other three-dimensional materials, valuable concomitant learning can take place in addition to the information gained concerning the particular subject.

Suggested Activities

1. Analyze a course of study in your teaching field and prepare a list of appropriate models, mock-ups, dioramas, and objects and specimens for use in it.
2. Have a committee prepare a list of sources of three-dimensional materials which are supplied free or on loan to schools. Ask your teachers for suggestions and check such sources as the Educators Guide to Free Instructional Materials and local libraries and museums. Organize the list in terms of subject areas and grade level and have it duplicated for distribution to the class.
3. Inspect a number of effective window displays in your community and analyze them in terms of arrangement, use of color, and lighting. Take pictures if possible, and make simple sketches of the layout plans. Show these by means of an opaque projector when reporting to the class.
4. Prepare a report on the display and exhibit facilities of a school building. Include tackboards and exhibit cases in the halls and classrooms. Evaluate your findings and make recommendations for practical improvements.
5. Divide the class into committees and have each committee plan an exhibit for future use in the school. Among the possible subjects are National Education Week, civil defense, conservation, gardening, seasonal sports, hobbies, educational or vocational guidance, and units of school subjects.
6. Storing three-dimensional teaching materials is a constant problem in many schools. Visit several schools in your community and gather information on how this problem is handled. On the basis of your findings, list practical suggestions for solving it.

Bibliography

Blanc, Sam S., "Models and Charts: Teaching Tools for Biology," *Teaching Tools,* Winter, 1957, pp. 66–69.

Brown, J. W., Lewis, R. B., and Harcleroad, F. F., *Audio-Visual Instruction,* McGraw-Hill, 1959, pp. 381–404.

Dale, Edgar, *Audio-Visual Methods in Teaching,* Dryden, rev. ed., 1954, pp. 106–122.

East, Marjorie, *Display for Learning,* Dryden, 1952, pp. 31–53, 255–280.

Educational Exhibits—How to Prepare and Use Them, U.S. Department of Agriculture, Miscellaneous Publication No. 634, Government Printing Office, 1948.

Exhibition Techniques, New York Museum of Science and Industry, 1940.

Haas, Kenneth B., and Packer, Harry Q., *Preparation and Use of Visual Aids,* Prentice-Hall, 3rd ed., 1956.

Hoger, W. V. G., "Plastics As a Visual Training Aid," *Industrial Arts and Vocational Education*, October, 1950, pp. 24A ff.

Kinder, James, *Audio-Visual Materials and Techniques*, American Book, 2nd ed., 1959, pp. 402–431.

Meeks, Martha F., *Models for Teaching*, Visual Instruction Bureau, Univ. of Texas, 1956.

Sands, Lester B., *Audio-Visual Procedures in Teaching*, Ronald, 1956, pp. 72–107.

Seehorn, R. W., "Models for Industry," *Educational Screen and Audio-Visual Guide*, June, 1958, pp. 286–287.

Sheppard, D., "A Method for Assessing the Value of Exhibitions," *British Journal of Educational Psychology*, December, 1960, pp. 259–265.

Torkelson, G. M., *The Comparative Effectiveness of a Mockup, Cutaway and Projected Charts in Teaching Nomenclature and Function of the 40mm. Antiaircraft Weapon and the Mark 13 Type Torpedo*, Technical Report SDC 269–7–100, Instructional Film Research Program, Pennsylvania State University, March, 1954.

Van Fleet, J., "The Diorama Comes to the Classroom," *Educational Screen*, June, 1943, pp. 204–205.

Weaver, Gilbert G., and Bollinger, Elroy W., *Visual Aids, Their Construction and Use*, Van Nostrand, 1949, pp. 92–117.

What Research Shows About Visual Aids, U.S. Department of Agriculture Extension Service, 1949.

Witmeyer, Stanley, "Display Is Visual Communication," *Instructor*, May, 1960, pp. 47–50.

Films

Anatomical Models, Silent, B&W, 15 min., Denoyer-Geppert.

Make a House Model, Sound, B&W and Color, 10 min., Bailey Films.

Model Houses, Sound, Color, 5½ min., International Film Bureau, Inc.

Museum of Science and Industry, Sound, B&W, 14 min., United World Films.

Museums for School Children, Sound, B&W, 21 min., United World Films.

Teacher as Observer and Guide, Sound, B&W, 22 min., Columbia University. (First 7 minutes most useful here.)

35mm. Filmstrips

How to Embed Specimens in Liquid Plastic, 53 frames, B&W, Syracuse University.

Simple Exhibit Technique, 40 frames, Color, Ohio State University.

CHAPTER 9

COMMUNITY STUDY

If our classrooms are to acquaint learners with the complex society of today, they must be thought of as places from which we can look in all directions, at all things, and into all times.

A program calling for planned use of the community enables us figuratively to go through the walls of the classroom and see for ourselves what people and their activities are like, and to catch a glimpse of what life may hold for us tomorrow.

Study of the social and economic community which is within easy reach of us and our schools offers outstanding opportunities to learn at firsthand the things that will affect our lives. Furthermore, community study serves well the long-accepted objectives of education—the development of self-realization, of human relationships, of human efficiency, and of civic responsibility. In their composite, these four purposes envision real-life experiences with which pupils must be familiar if they are to participate effectively in home, school, and community life. Although many objectives of education can be achieved through reading, discussion, and simulated experiences presented by means of films, pictures, filmstrips, etc., a realistic grasp of the interactions of social and economic existence is best gained from direct experiences with people in their daily activities.

The pupils in a class on problems of democracy were studying the organization and function of local and state government. The teacher asked, "How many of you have attended a session of the state legislature?" No one had. "How many have attended a meeting of the common council?" Again no response.

The teacher continued with questions which sampled awareness of the city's service organizations, such as the water purification plant, the Highway Service Department, the Sanitation Department, etc. Although there were a few affirmative responses, 90 percent of the students had had little or no firsthand experience with local governmental agencies or functions.

During the past three years, however, this same group of pupils had "studied" the relationships of the earth's atmosphere to space vehicles and space travel. They had traced the story of mankind from the dawn of history to the present. They had studied the "type" regions and countries of the world and could relate interesting facts about the Congolese of Central Africa and some of the problems with which the United Nations is confronted.

These pupils had spent years studying about people and places and events that occurred long ago and thousands of miles away, but they were poorly informed about local economic and political functions and organizations which affect their daily lives and their future welfare. Education for current social living needs to be improved.

In many cases the situation just described is the outgrowth of inertia which is inherent in our own teaching procedures. This inertia results from the fact that some teachers unquestioningly accept the orderly, systematic curriculum plan handed to them by a higher authority, and in their classroom work and study they depend too completely on easily accessible materials.

As we contemplate the many sources of information presented by the immediate community, we must include those within walking distance or a short bus trip, or those that can be brought right into the classroom, either in person or by mobile demonstration.

The local factory, the retail store, the business office, the packing plant are real. School children can see them, hear them, ask questions about them, examine them minutely. The banker, the returned traveler, the city official are often willing to come to the classroom and be interviewed by the pupils.

If we believe that firsthand experiences with people and things are primary sources of learning, we must arrange to investigate systematically the resources of local communities as part of the organized school curriculum.

MEANING AND SCOPE OF COMMUNITY STUDY

COMMUNITY STUDY DEFINED

Community study describes learning situations through which pupils come into firsthand contact with the people, places, and things all about them. It includes visiting, interviewing, participating, listening, seeing, examining, questioning, often learning by doing, and gaining understanding about the things, processes, services, and social activities that make up the stream of community life.

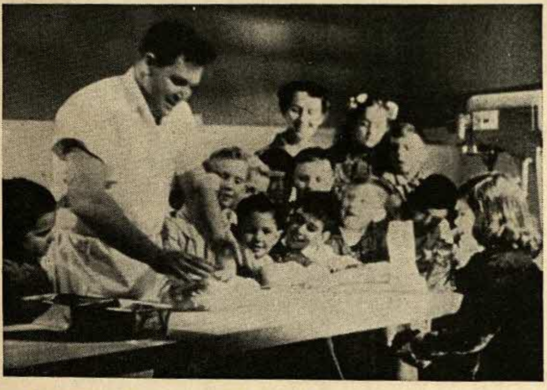


Fig. 9.1. The village baker leaves his shop to become "a firsthand learning experience." What responsibilities are here assumed by members of the community? By the teacher? By pupils? By the school administrator?

There are two main avenues of community study. People or things representative of desired community activities may be brought to the school (Fig. 9.1), or the class or some of the children in it may visit definite community situations to study them firsthand and relate them to the classroom activities.

Through community study the scope of the classroom is enlarged to encompass areas of the community that *need to be investigated and understood.*

Community study makes seeing and hearing realistic and exciting avenues for learning. But time must be provided for reflective thinking, planning the next steps, and further study. Finally, community study experiences may become the basis of individual contributions to group projects. The relief model in Fig. 9.2 will be a record of the class's knowledge and accomplishment.

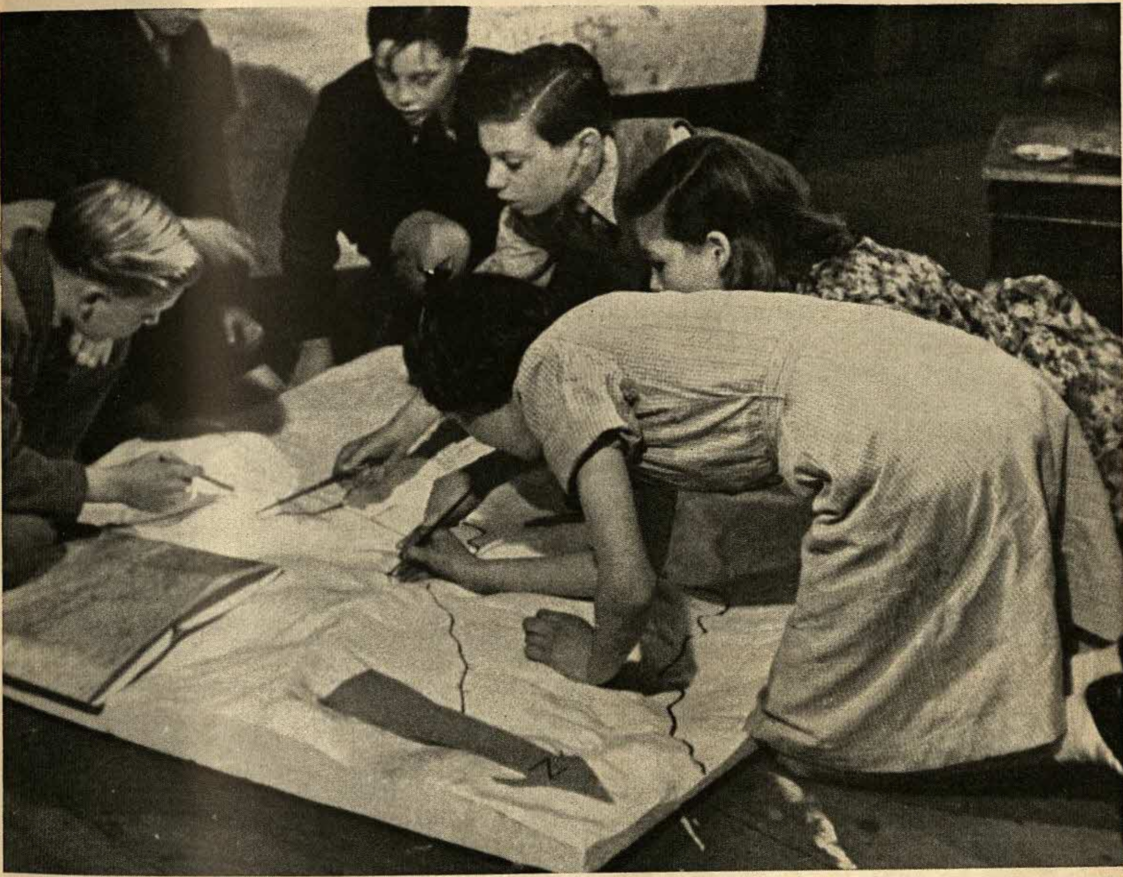
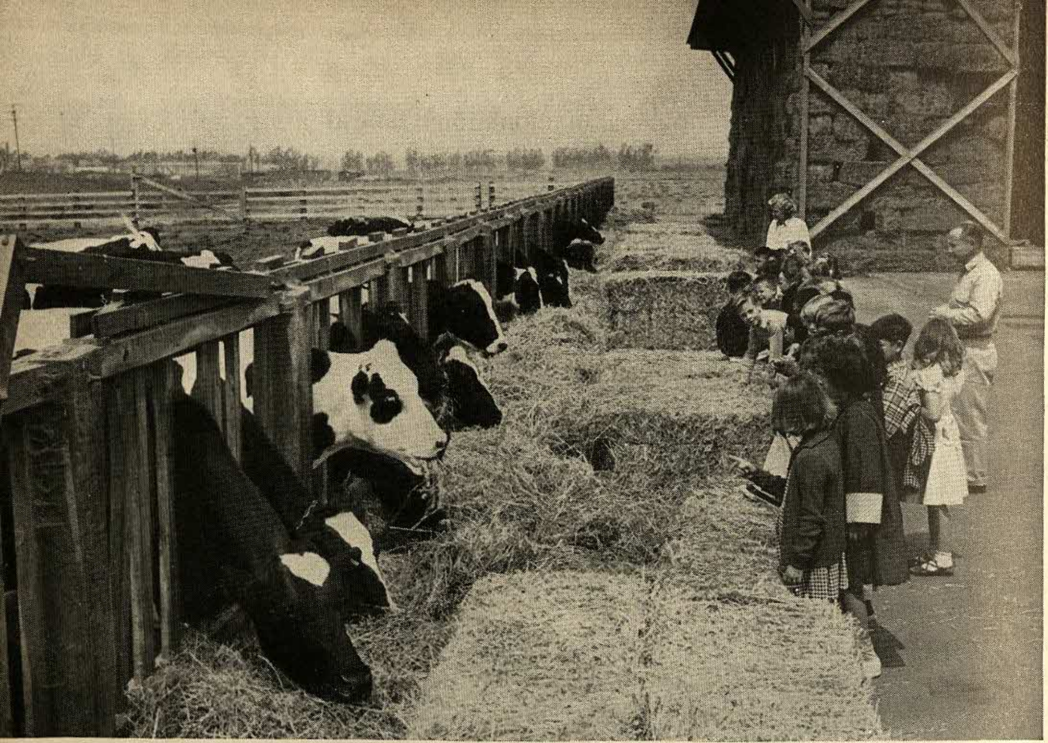


Fig. 9.2. What outcomes of community study are apparent in this situation? What relationships exist between these activities, community study experiences, and the achievement of tool subject skills?

The literature on community study describes variations which have as wide range as the accounts that are given about them. Community study reports include national caravan tours, youth hostel excursions, and world tours which, as their descriptions reveal, are only casually associated with the school's total program of planned educational experiences that should be available to all the children. Other reports describe community study as it is presented here, as the *formally designated part of the school program which extends the classroom into the community or brings the community into the classroom in order to give all the learners increased experience with real things*—real things which relate to the curriculum plan.

The names used for community study vary as widely as the descriptions of it. Most frequently used are school journey, excursion, field trip, tour, school visit, etc. In this chapter community study will be presented in



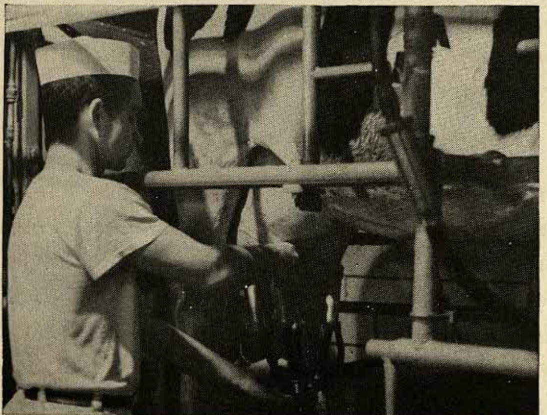


Fig. 9.3. The realities of dairying with its corral and milking parlor, must be seen and discussed on the spot in order to understand how mechanization has changed an old, old procedure. What responsibilities does this place on pupils and teachers?

terms of school-authorized, teacher-planned, curriculum-integrated experiences during which things, services, and processes in the community that are related to curriculum plans are studied by pupils under teacher supervision.

READINESS AND COMMUNITY STUDY

One of the great inconsistencies of our educational planning is the fact that a child, on reaching the age of six, is placed in an environment which often restricts his natural inclinations. This child has spent the first five years of his life wiggling, crawling, manipulating, investigating, and exploring endlessly. Suddenly he finds himself "in school," restricted to the confines of a chair or desk. This situation is one of the anachronisms of educational planning.

To expect the six-year-old to conform to the restricted environment of a classroom for five hours a day, five days a week, is to run counter to all we know about his mental, emotional, and physical make-up. This child should be allowed to pry into every corner of his environment as he participates in carefully planned, school-controlled community study experiences. Instead of being confined to the four walls of a classroom, he should be "free" to investigate his "world": the school yard, his friends' homes, the business district, and the open country outside the area he lives in.

The "schoolroom" for this child should include the caterpillars in the school shrubbery, and the small stream with its myriad wonders—water plants, the wriggling insects and pupae, tiny fish, and the sparkling crysstalline rocks and stones on the stream bed. The school day should include "talks" and "visits" with community helpers—the mailman, the fireman, the policeman, and the people who are engaged in laundering, dairying, breadmaking, poultry raising. These "near-at-home activities" with which the child comes into such constant contact as he eats, dresses himself, keeps himself clean, and responds to his parents, teachers, neighbors, and other children his own age are subjects for community study.

SCOPE OF COMMUNITY STUDY

Near at home there are things to see, examine, and learn from. These represent one edge of the community resource spectrum. At the other extreme are field studies which may be as complicated as the long-distance speaker-phone group interview described in detail later in this chapter. Between these extremes are learning situations such as those involving visits from an expert who explains and demonstrates to a class, a bus trip to government agencies, industries, or museums; and the long-range special learning trip to school forest camps, conservation stations, etc. The scope of community study will be discussed in terms of walking trips, field study, visits by resource persons, special learning trips, and research surveys.

Walking trips provide study experiences in the immediate vicinity of the school, such as parks, fire stations, and stores, for observing, inquiring, and learning at firsthand. In the lower grades the "buddy system," in which each child is paired off with a dependable fellow pupil, is one effective way of getting the class to places within fifteen minutes' distance of the school. The teacher usually brings up the rear, knowing from experience who can be depended upon to head the column.

Field study usually involves an automobile or bus trip to outlying truck farms, dairies, arboretums, museums, TV stations, banks, packing plants, or industries. Such trips should be made after carefully planned introductory study has aroused pupil interest to a point where it can best be satisfied by the many kinds of concrete experiences made possible by field study.

For example, an intermediate-grade class can read at length about the nutritional aspects of good diet, local and state food inspection services, and mass production in dairying, only to find that in reality the situation is not entirely clear. As class interest continues, a visit to a dairy (Fig. 9.3) is a highly individualized means of discovering that dairy cows today are much larger than was true even a decade ago, and that they are actually part of an automated mass-production process which begins in the fields and ends when milk is sealed in disposable paper containers.

The steps involved in achieving maximum learning from planned field study are discussed later in this chapter.

Visits by resource persons are a valuable means of bringing demonstrations and specialized information into the classroom, particularly when field study is not possible because of rigidly defined time schedules, as in junior

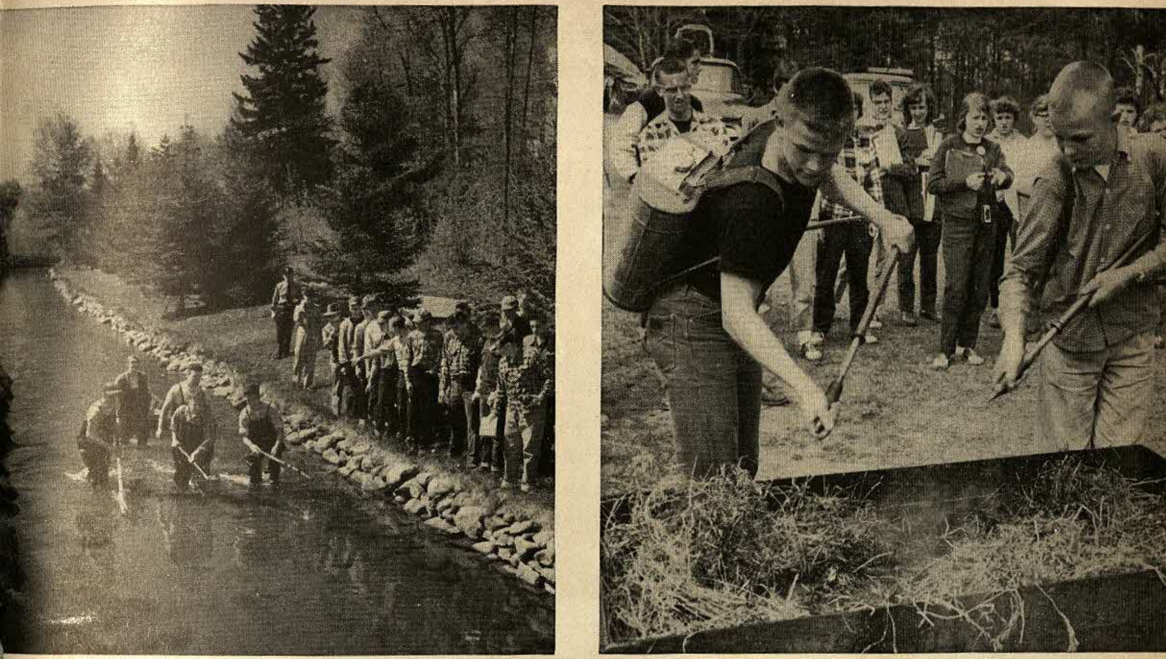


Fig. 9.4. Between the formal classroom and the usual community resources there are a variety of quasi or special educational learning opportunities. The school camp or "conservation school" is really an extension of the classroom. Here teachers and pupils pan for gold, and observe fish "shocking" and methods used in controlling forest fires.

and senior high schools. Resource guests may be recruited from parents of school pupils, friends of the school, and representatives of banking, communication agencies, accountants, chemical and electronic industries, legislative and judicial agencies, and the various branches of the armed forces. Resource persons can usually supply demonstrations and answers to any questions that go beyond the teacher's more generalized information.

We may ask, "Shouldn't the teacher be able to do a complete teaching job himself?" He should be expected to take the initiative in planning and evaluating the contributions made by resource persons. But in this day of complicated social structure, even the best-informed teacher may become better when he uses the supplementing experiences provided by carefully selected resource persons.

Special learning trips include planned visits to independent or related educational projects such as forestry conservation camps, distant school camps maintained by the local school board, and special museums and exhibits.

Many school systems, particularly in the Middle West and Pacific coast regions, maintain school camps. Usually pupils in the upper-intermediate grades or junior high school are given an opportunity to spend a week or two during the regular school year at such a camp.

The visit to the school camp is usually scheduled so that systematic study of conservation, astronomy, wildlife, biology, plant life, and marsh, lake, and watershed interrelationships can be made at firsthand (Fig. 9.4). Such study is often under the direction of the home classroom teacher in cooperation with the resident school camp instructor.

Research surveys represent the highest organizational form of community study and are usually reserved for upper-grade classes and for high-school pupils with exceptional ability. These surveys are the means of investigating local, state, and national government and current social conditions. Gifted pupils in particular benefit from the opportunity to ask specialists to answer questions that are fundamental for any evaluation of such contemporary living problems as housing, taxation, public health, recreation, education, public works, safety and protection, job opportunities, etc.

Since such surveys frequently go far beyond the city and even the state, several methods of interviewing are used.

Personal interviews are readily possible when pupils and local people are involved—census officials, tax collectors, school board members, housing officials, members of the legislature, judges, social service workers, etc. But as research continues, it is often necessary to interview state and federal officials. This can be accomplished by means of a long-distance speaker-phone interview (Fig. 9.5).

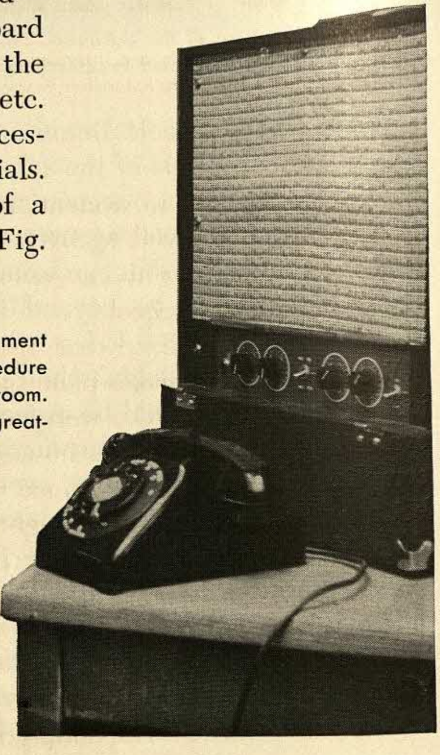


Fig. 9.5. Here is the tele-speaker, the basic equipment for long-distance speaker-phone interviews. This procedure brings current authoritative information into the classroom. Where in the curriculum can this technique make its greatest contribution?

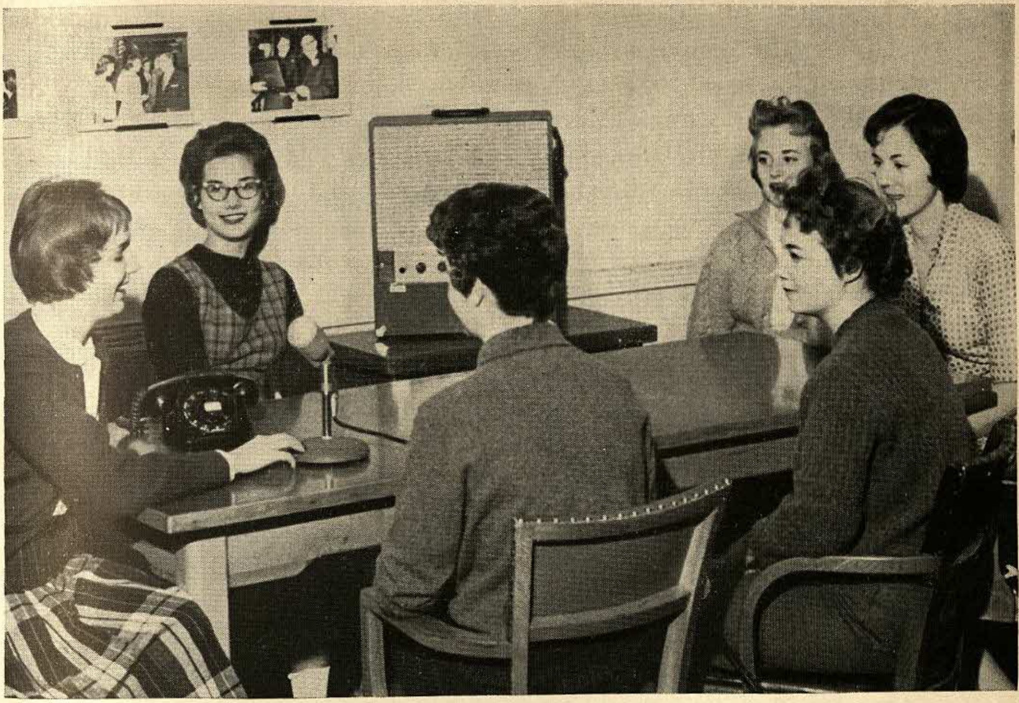


Fig. 9.6. These students are interviewing a government official who is talking from his office 800 miles distant. What pupil-teacher responsibilities must there be to make this a learning situation and not a "stunt"?

Recently, a group of students in a class on American government carried on such an interview (Fig. 9.6). Their objective was to discuss and secure answers to questions about governmental activities and conditions in the world outside the school.

Their teacher realized that, instead of the class making extensive trips, the long-distance speaker-phone procedure would enable him to bring experts on civic affairs who were hundreds or thousands of miles away right to the classroom to explain how government actually works. The students prepared carefully for the phone interviews; they discussed what they had read, and formulated well-thought-out key questions to be answered. Next, with their teacher, they listed the names of authorities whom they felt could answer these questions. They then wrote letters asking these people for a date and hour that would be acceptable for a speaker-phone interview. As a result, judicial and administrative department heads participated, and in many cases the entire 40-minute class period was devoted to the interviews.

What about costs? Depending on the distance involved, a series of interviews 30 to 40 minutes long ranges from $8.40 to $15.60 each.[1] In view of the fact that these calls make possible authoritative answers to specific questions on whose preparation the class may have spent weeks, this cost is small.

Why could not this research survey have been done entirely by letters? It of course could have, but at the expense of the give-and-take that normally characterizes conversation. A long-distance speaker-phone interview is much more spontaneous, it is personal rather than impersonal, and it is more productive of information.

Research community surveys often have noteworthy results. In Wisconsin, for example, a high-school group actually initiated a community housing project. In New York, action begun by a similar group led to a slum clearance project. What is a better way of initiating pupils into their future role of responsible citizens?

The use of community study and resources is a matter for the teacher to think about in terms of objectives, the age and interest of his pupils, and the climate of the school and community in which he works. As one teacher said: "Our community study opens vistas which demand the investigation of the world itself."

In the upper grades various subjects—mathematics, chemistry, physics, and English—may be motivated and made increasingly real by local study arrangements. Thus youthful chemists are taken to the air-reduction plant and to the petroleum-chemical industries in the nearest industrial center.

Young mathematicians, pondering the utility of the formulas and geometric relationships they are studying, need to examine leaf structure; the triangular prismlike form of a conifer needle; the intricate maze of angles, supporting beams, and other members of a railroad trestle; and the form of setbacks in architecture and the reasons for their use.

The student of English or communications finds substance for themes in every investigation he makes. He can use this information later in class discussions, in writing advertising copy, or in creating a radio newscast.

The idea of community study is not new. Among the first modern educators ordinarily acknowledged as presenting logical arguments for local study were Pestalozzi, Herbart, and Froebel. They reiterated their views about learning again and again: *Learning experiences which are real, lifelike, and available to the learner for firsthand scrutiny, questioning, and recognition are likely to be the most effective avenues through which children become informed about their social and natural environment.*

The immediate community often provides extremely dynamic, interesting, real-life opportunities for learning. It is the responsibility of the administrator and teacher alike to investigate the community, particularly the resources which seem to identify themselves with a more clear-cut and fuller understanding of formal school experiences.

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[1] Harold Rubin, "Interviews by Long Distance Stimulate Learning Rate," *College and University Business*, February, 1961.

PLANNING CLASSROOM COMMUNITY EXPERIENCE

New ways of arranging for community study opportunities have recently been investigated. In Manhasset, New York, the "world" of the community has been divided into experience opportunities which call for the student to observe outside the classroom, and opportunities *which can just as easily be brought into the classroom.* Both, needless to say, are important, because they complement each other. Is it not logical to expect that communities which originally authorized the creation of a public-school system to prepare youth for community participation should welcome the incorporation of firsthand observation of the community as a part of instruction? If this kind of instruction is to be successful, both lay and professional workers who are qualified should help. Thus, a committee of interested parents and teachers set about to survey the Manhasset community's resources: *people and their specific skills and knowledges.* This committee sought to discover the true wealth of the community in terms of the people in it.[2]

The committee began by interviewing professional and business people to discover what skills and abilities they had that would enrich learning situations in the classroom. This information was then catalogued for reference by interested teachers. In this way the committee discovered, for example, that a very able lawyer could be available when the social studies class was investigating personal rights and the techniques and procedures of court action. The local nurseryman who had developed certain grafting techniques would explain them to general science students. A local ceramist was willing to explain and demonstrate glazing techniques to the art class. The local music store proprietor, a skilled cello player, was willing to help the members of the school orchestra who played that instrument.

The teacher is skilled as a student of child psychology, of classroom method, and of modern techniques for providing educational experience, but he cannot be expected to know the intricacies of community life and activities as well as others do. With the increasing complexity of the modern world of information, every teacher should welcome useful learning experiences that can be supplied by the resources of the community, its people and their skills (Fig. 9.7).

In every situation *the teacher must be the one to decide when a commu-*

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[2] *The World in a Schoolroom,* Sound, B&W, 20 min., United World Films.

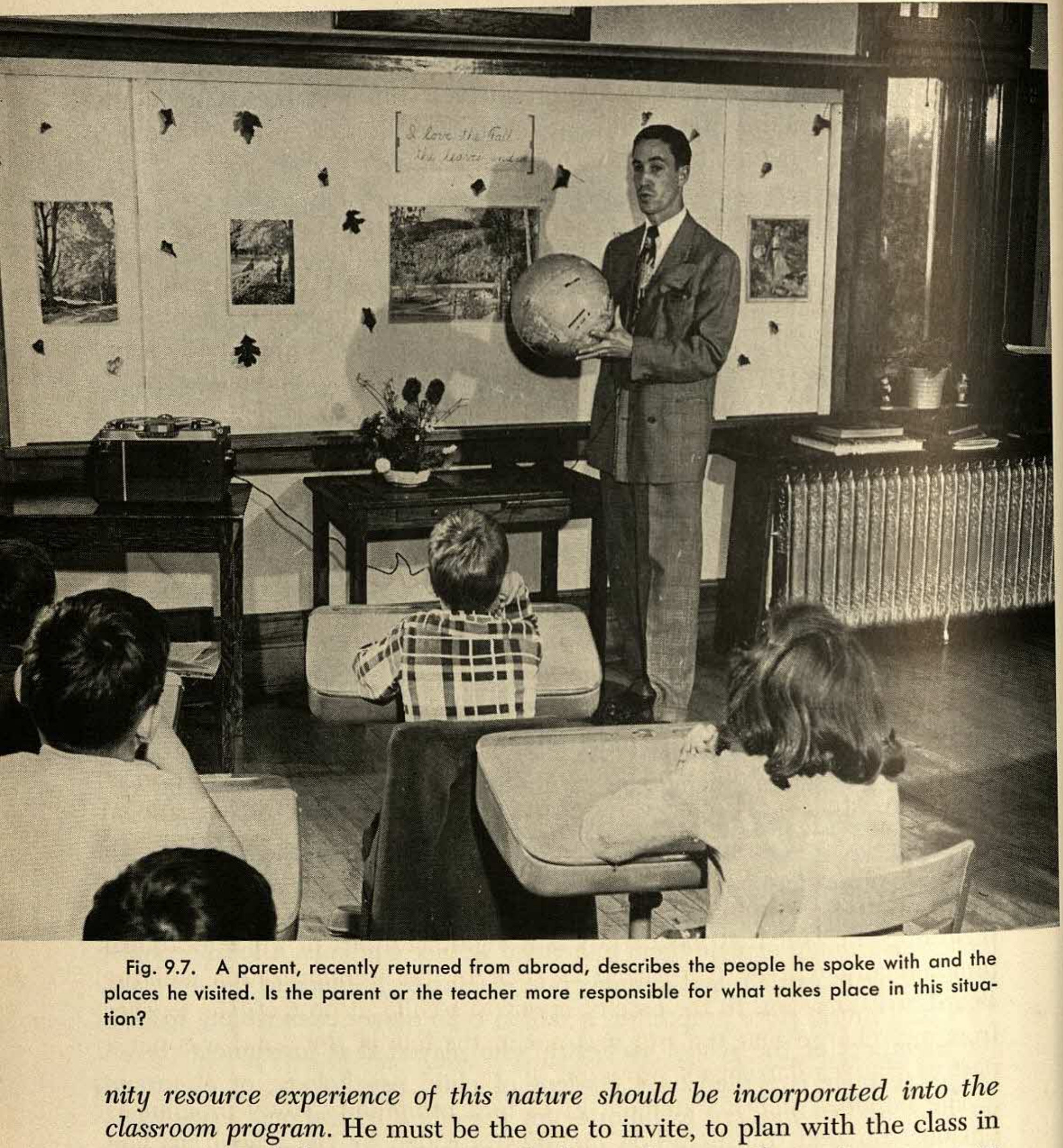

Fig. 9.7. A parent, recently returned from abroad, describes the people he spoke with and the places he visited. Is the parent or the teacher more responsible for what takes place in this situation?

nity resource experience of this nature should be incorporated into the classroom program. He must be the one to invite, to plan with the class in anticipation of the experience, and ultimately to evaluate its success or failure. This kind of school and community cooperation under proper teacher initiative and guidance offers unlimited enrichment possibilities.

There are variations of this Manhasset community resources program. Thus on school career days, local professional men, craftsmen, and tradesmen come to school to present to interested pupil groups firsthand accounts of their particular role in the community and to answer questions. Other schools have community days on which parents attend homeroom sessions and discuss community responsibilities with students.

Selecting and using resource opportunities in the immediate community can provide enrichment which the teacher, regardless of his broad training and effective work, is frequently unable to provide.

PLANNING OUT-OF-SCHOOL COMMUNITY STUDY

Most teachers readily agree that if they are to help the student achieve his goal of community membership, they must arrange for him to observe community life and activities at firsthand. To provide appropriate opportunities of this type is a primary goal of out-of-school community study.

But because they are not sure of the reaction of the administrator, the school board, or the community to plans for leaving the classroom for study, teachers often avoid such opportunities. Thus, the responsibility for making community study a going part of classroom activities often rests with the community itself, the school board, and the school administrator.

For this reason, school administrators and boards of education have encouraged the planned use of community study with resolutions like these: "The field trip carefully planned, wisely interpreted and skillfully supervised is a useful and vital extension of the classroom program."[3] "In order to provide the most effective teaching environment, field trips and excursions outside the classrooms and school buildings and grounds under the supervision of members of the school staff are considered by the Board of Education as an extension of the classroom and an integral part of the educational program."[4]

In the bulletin giving his interpretation of this resolution the superintendent said, "The purpose of this resolution is to remove any possible doubt regarding the fact that local study is a legitimate part of the educational program and will be recognized as such by the administration and the Board of Education. In the case of injury to a child, it protects the teacher from any charge that the trip was not in the line of duty and was not a part of the regular school program."[5]

The impetus such a statement gives to a community study program is obvious. Bonded transportation facilities provided by the school bus line or by a local transportation company remove other possible barriers to the execution of such a program. The limits of the environment that can be explored by the children are as broad as the school day itself, which may range from 9:00 A.M. to 4:00 P.M. Good roads, modern transportation, and careful planning can enlarge the school's study and learning environment to a radius of as much as 100 miles, with the school as the center of the circle.

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[3] *Community Classrooms, a Guide to Educational Field Trips,* Seattle Public Schools, 1956.

[4] *Bulletin* 89, Madison (Wis.) Public Schools, June 9, 1943.

[5] *Ibid.*

LOCATING USEFUL COMMUNITY STUDY SITUATIONS

A systematic search for community study opportunities is usually the first step in beginning a program. Such plans may be discussed during faculty meetings, P.T.A. planning sessions, or teacher-principal conferences. In one such conference a third-grade teacher told the principal that when she suggested that her pupils visit a dairy during their study of truck and dairy farms, the children told her that they had already been to one. Investigation revealed that not only had they been taken to one of the local dairies, but they had visited the same dairy in kindergarten, in the first grade, and again during the second grade. This led to the teaching staff's decision to conduct a status survey of existing local study practices.

The teaching staff decided to do two things: (1) to survey community opportunities for study, and (2) to examine community situations in terms of the degree to which the various work units could be enriched through selected local study opportunities.

A young child may gain one type of experience in a given community study situation. But this same child, two or three years later, may investigate the identical study situation from an entirely different point of view and in search of a new set of outcomes. Accordingly the teaching staff recognized that visits to some community situations may be repeated if circumstances seem to warrant it.

One year later, as a result of this teacher-inspired investigation of community resources and their relationship to units of study in the elementary grades, a list of recommendations was drawn up. In each case selected local study situations are paired with the units of study to which they relate. No study situations were assigned to more than two grade levels. Here, for example, are recommendations for Grades 4 and 5:

LOCAL STUDY SITUATION	UNIT OF STUDY
Grade 4	
Apiary	Insects
Arboretum	Trees of Our State
Biology building exhibits	Bird Friends Insects Wild Flowers and Plants
Game and Fur Farm (Poynette)	Animals of Our Fields and Woods

Grade 5

Airport	Transportation
Bus barns	Transportation
Fish hatchery	Fish
Forest Products Laboratory	Forests of the United States
Historical museum	Transportation Changes in Schools
Post office	Communication
Quarry	Rocks and Soil
Radio station	Communication
Railway station	Transportation
Streamliner train	Transportation

Schools across the United States are planning community resources as a regular part of the teaching day. Many public-school system reports are representative—for example, those of Seattle, Chicago, and Louisville, among others—and may be used as a basis for study and planning.[6]

A number of researches undertaken in the field of community resources show distinct advantages for this kind of study. These studies indicate the desirability of community resource studies—both the kind in which resource people and demonstrations are brought to the classroom and those to which the pupils are taken in bonded vehicles such as school buses.

Local study opportunities vary from community to community. The opportunities which the teacher in an open rural area has are only slightly related to those of a teacher in a crowded metropolitan center. However, it is just as desirable for the rural group to have study experiences in a metropolitan area as for the children in crowded city schools to experience being in the open country.

Community study opportunities are available to every school and should be explored.

TEACHER LEADERSHIP IN COMMUNITY STUDY

Following the investigation of community resources and the correlation of local study opportunities with specific units of study, each teacher is confronted with certain responsibilities that must be met during community study. The following are typical:

1. Preliminary preparation.
2. Preliminary discussion of study objectives.
3. Observation.

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[6] Those who wish to familiarize themselves with the community resource idea should write to such school systems as those listed in the Bibliography for community study curriculum manuals. The resource opportunities described in these manuals have been selected and recommended because of their efficiency in fostering learning through firsthand observation.

4. Follow-up discussion and evaluation.
5. Follow-up projects growing out of community study.

To illustrate these responsibilities, we shall assume that the teacher and pupils are about to begin a study of air transportation. They will have a variety of ways in which to discover the meaning and relationships of air travel and its effect on people and the community. They will need to select activities through which understandings can be gained. Books, pictures, films, interviews with air personnel, pupil experiences, slides, air charts, a visit to the airport—all may be discussed. It will be assumed that a trip to a local airport is possible near the beginning of the unit as a means of gaining understandings that will be highly useful in continuing the study of air transportation. In order for this experience to produce results, the teacher should vary his usual classroom planning.

PRELIMINARY PREPARATION

Usually the teacher visits the airport beforehand. If after this preview he believes that the airport will provide a valuable learning experience for the class, he proceeds with further planning.

As much responsibility as possible should be given the children. In terms of their age and level of maturity they can assume certain responsibilities, such as the following:

1. The children should, if possible, invite the airport manager, a stewardess, a pilot, a ticket agent, a freight agent, to come to their classroom and help them plan their visit. If this is not possible, they may telephone or write the airport manager, asking to visit the airport, arranging a time, learning about behavior during the visit, etc.
2. The children should write letters to their parents and the principal telling of their plans, route, purposes, etc., in connection with the trip. Both parents and administrator should be notified that the children are leaving the school building.

The teacher should decide which is the safest route. If transportation is needed, the school bus should be used. However, if private passenger cars are used, they should be adequately covered by passenger liability insurance. Whenever possible, bonded carriers—usually buses—should be engaged. They should be told exactly when to pick up the children at the school and should discharge them in a designated safety zone at the airport.

PRELIMINARY DISCUSSION OF STUDY OBJECTIVES

As in beginning any new unit of study, preliminary discussion of a proposed community study will assist the children in developing definite purposes and will arouse their curiosity and interest in the experiences, understandings, and factual information they will acquire. Such discussion will give them an opportunity to discuss information they already have. It will also reveal inaccurate or purely imaginary concepts and ideas about the local study situation.

On the basis of what the children already know and of what it is hoped they will learn, teacher and pupils should plan what they hope to achieve as the result of their visit to the airport. Their objectives may include:

1. To learn how weather information is used by the airplane pilot.
2. To find out about the cost of passenger travel, the distance to given destinations, and the time required to reach them.
3. To learn more about the duties of the stewardess.
4. To find out how airmail and air express are handled.
5. To find out what makes an airplane stay in the air.
6. To find out about fuel consumption, cost of operation, etc.
7. To learn how the airport serves the community.

More subtle purposes may have to be suggested by the teacher. Such purposes include seeing who can "unearth" the most unusual information, who can be the most courteous, the most completely responsible for his own good behavior, etc.

Every new area of study imposes a certain specific vocabulary responsibility. Hence the teacher will consider in advance any new or unusual vocabulary items that will influence the opportunity for more complete learning during the visit. In this case these terms may well include "ceileometer," "alto-cirrus," "cumulus," "anemometer," "radar," "vector," "omnirange radio," etc.

Although these words may be high up on any formal word-count list, the need the children feel to know them and the interest they show in attaching significance to them make them necessary new vocabulary items. Prestudy and discussion of terms that are essential for complete learning in the situation will give the children increased opportunity for attaching meaning and understanding to their contemplated real experiences.

The combination of anticipating learning problems and being given a clear-cut and definitive statement of the objectives to be achieved is the best preparation the learner can have in advance of the actual visit.

OBSERVATION

While the students are at the airport, they must be encouraged to be alert in finding answers to the questions they want answered. It is impossible to anticipate all the questions the children will ask at the airport. For this

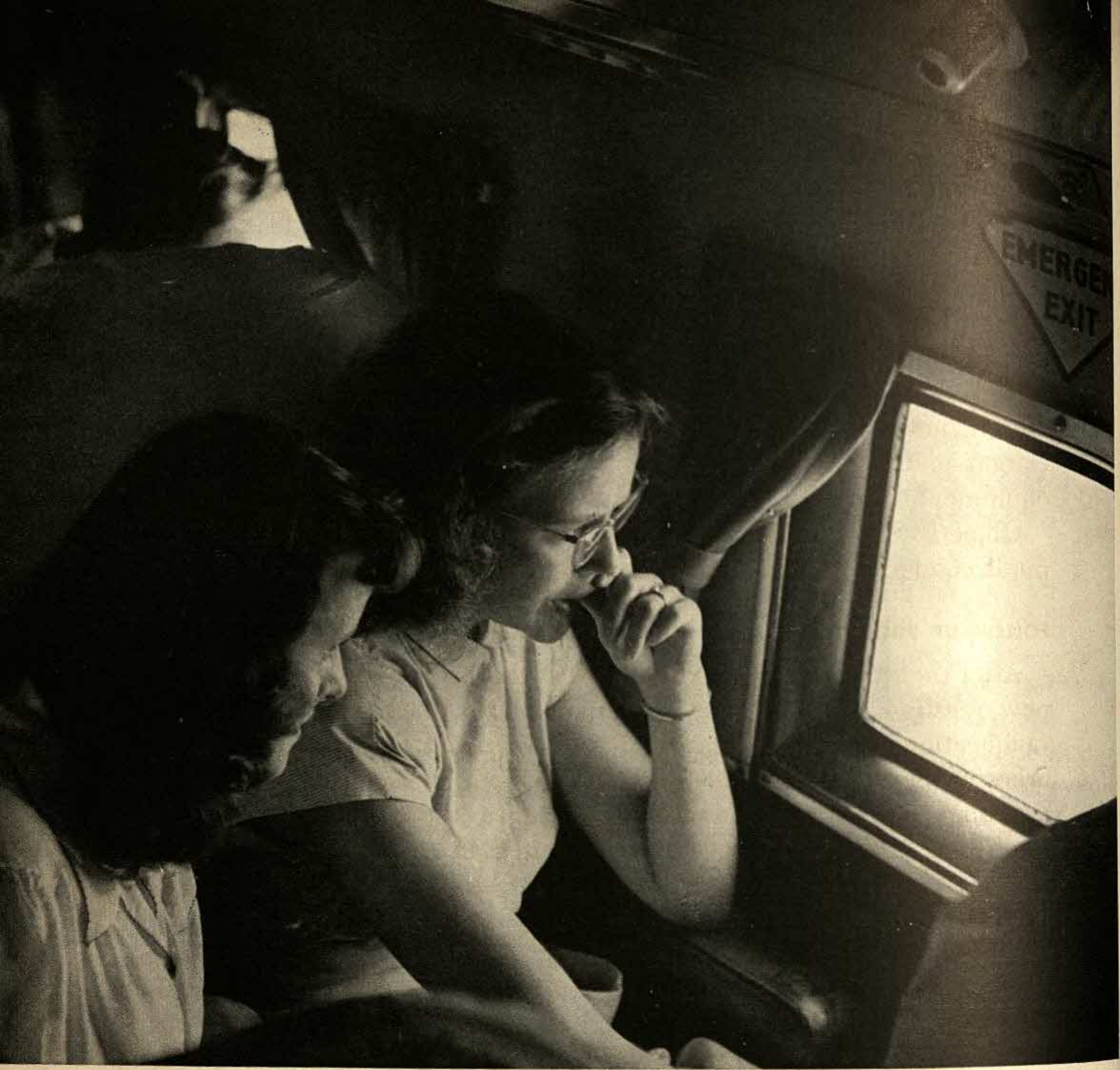


Fig. 9.8. The word "clouds" takes on many new meanings as these students fly through them and observe cloud formations from above.

reason every child must realize that he is expected to ask questions and to investigate what he sees as he goes from weather station to control room. A teacher soon learns to anticipate a student's need for further explanations.

Note taking should be encouraged. When possible, take along a camera and photograph complicated airport equipment and procedures so that these pictures, or slides made from them, may be examined and discussed in the classroom.

Once the student is back in the classroom, his impressions of a field trip may be marred by several things. Noise and confusion may have interfered with complete understanding. Other mechanical problems such as space or lighting may have blocked it. Haste imposed by the necessity of meeting time schedules may have made possible only a fleeting glimpse of an important operation or piece of equipment.

FOLLOW-UP DISCUSSION AND EVALUATION

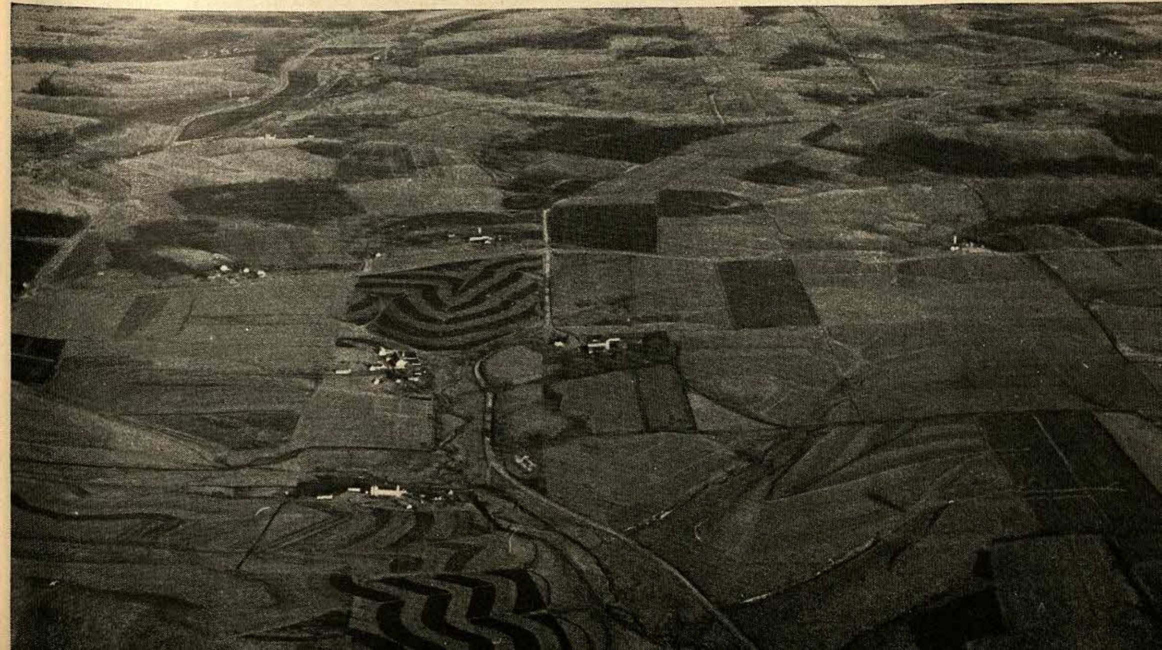
After the trip, classroom discussion should be encouraged. This, of course, is one kind of evaluation technique. Other outcomes of the visit include written descriptive accounts, letters to friends describing experiences at the airport, news releases for the class or school newspaper, letters of appreciation to the airport personnel, graphic or pictorial records of aircraft, equipment, etc.

Objective tests of the completion or true-false type prepared by teacher-pupil cooperation are very helpful in analyzing outcomes.

FOLLOW-UP PROJECTS

After their discussion of experiences at the airport, the children may have new questions. Usually a new experience leads to curiosity about countless ramifications of it. Girls may be interested about the work done by stewardesses, boys about meteorology, both about air freight. To answer such questions appropriate persons—a plane stewardess, a weather forecaster, an air freight agent or pilot—may be invited to come to the classroom to

Fig. 9.9. The Air Age point of view opens new areas for understanding. Land-use problems and their solution are understood in a flash when seen at 5000 feet elevation and photographed for later reference in class.



describe his work, to display materials, charts, and other things that visualize his work, and to answer questions or help develop further plans for the class.

Other follow-up plans may encourage the construction of models, murals, and study displays. Children interested in building models may correlate problems involving linear measure, angle construction, and mechanical drawing in a scale drawing and model of the airport. Those interested in science and electronics may wish to investigate directional beams and instrument landing systems.

As the result of other community study situations, it may be possible for student groups actually to participate in projects which benefit the community. One needs only to ride through the reforested sections of the North Central Plains states to see conservation projects that have resulted from field trips. Along the roadway are signs reading "School Forest." Such forests are plantings of young pine trees, usually the result of the school children's study of conservation.

Field trips in the community may create opportunities to participate in civic affairs. Several worthwhile follow-up projects of this sort are shown in the films, *Learning Democracy Through School and Community*[7] and *Our Town Is Our Classroom.*[8] A field trip to the local common council might be followed by the revising of student government election campaign regulations. Visits to local industries lead logically to organizing a school and community vocational guidance plan, under which professional men and representatives of labor and industry come to the school on scheduled occasions to discuss their work and to advise the pupils about vocational opportunities and choice. Civic clean-up campaigns, the erection of safety signals at danger spots, and the provision of recreation centers, play areas, and hostel circuits are additional community study projects of the same nature.

Community study may become the basis for many intraschool activities such as discussion panels, mock radio broadcasts, displays of artwork, and exchange reports with the classroom across the hall. Its most significant outcome, however, is seen when students plan ways in which they as future citizens can participate *now* in making their community a better place to live in.

EVALUATING COMMUNITY STUDY

As was said above, community study should be a carefully planned learning experience. Following it, the teacher should evaluate its success in terms of what was experienced by the children who participated. Such items as the following are objective measures of success or failure:

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[7] Sound, B&W, 16mm., 20 min., Educational Films Service.

[8] Sound, B&W, 16mm., 18 min., United World Films.

1. This visit or interview was arranged because it was closely related to planned curriculum objectives. Yes .... No ....
2. The experience was worth the time and effort required because it provided useful learning opportunities which could not have been presented by ordinary classroom methods. Yes .... No ....
3. The students themselves became responsible for:
   a. Knowing the purposes for which they undertook the community study. Yes .... No ....
   b. Formulating safe-conduct attitudes. Yes .... No ....
   c. Devising follow-up discussions and evaluation. Yes .... No ....
   d. Initiating follow-up activities. Yes .... No ....
4. The teacher observed all local school regulations concerning community study visits or interviews by:
   a. Previsiting the place to be studied. Yes .... No ....
   b. Arranging time of departure, arrival, and return via school bus or other bonded carrier. Yes .... No ....
   c. Sending study announcements home with children. Yes .... No ....

COMMUNITY STUDY LIABILITY

Teachers may have questions about their personal liability for accidents or injuries to pupils while participating in community study situations.

The community, acting through its representatives, the school board, should decide whether community study opportunities are to be provided. School boards and school administrators have the responsibility of establishing policies concerning community study (see page 251). Similarly, the teacher has the responsibility of planning for community study situations with the same care he uses in his day-to-day classroom teaching.

The following are the responsibilities which school boards, school administrators, and teachers have in connection with community study experiences.[9]

1. The school board should acknowledge community study as a desirable enrichment experience and an integral part of the school's regular program. (See page 251.)
2. The principal should make the school board's policy known to the teachers.

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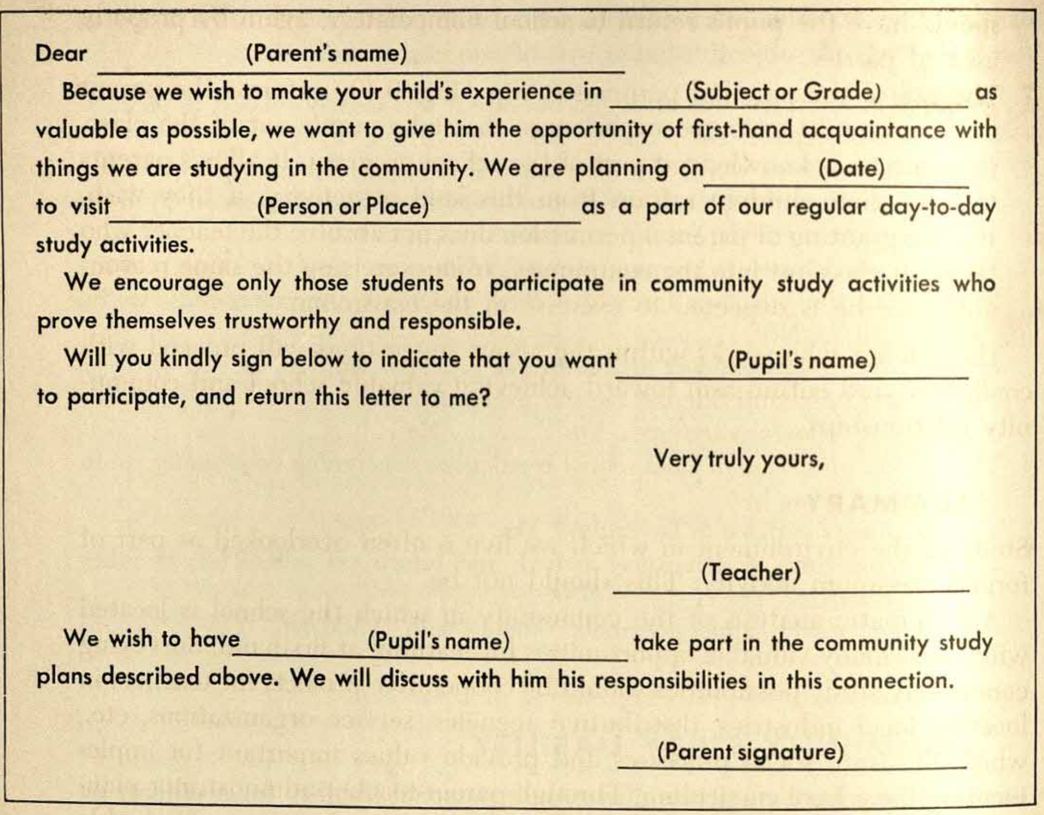
[9] See also Edward G. Olsen, *School and Community*, Prentice-Hall, New York, 1945; "The Bi-Weekly School Law Letter," February 4, 1954, published by Dean R. R. Hamilton, College of Law, University of Wyoming, Laramie.



Dear (Parent's name)

Because we wish to make your child's experience in (Subject or Grade) as valuable as possible, we want to give him the opportunity of first-hand acquaintance with things we are studying in the community. We are planning on (Date) to visit (Person or Place) as a part of our regular day-to-day study activities.

We encourage only those students to participate in community study activities who prove themselves trustworthy and responsible.

Will you kindly sign below to indicate that you want (Pupil's name) to participate, and return this letter to me?

Very truly yours,

(Teacher)

We wish to have (Pupil's name) take part in the community study plans described above. We will discuss with him his responsibilities in this connection.

(Parent signature)

Fig. 9.10. Parental consent form for student participation in community study experiences.

3. The school board should provide liability insurance for the teaching staff. In Wisconsin, for example, and in many other states school boards are legally authorized to expend public money for this purpose.
4. The teacher and principal should plan community resource activities which will help to accomplish goals of existing curriculum plans. Such activities should not be confused with festivals, holiday excursions, and other out-of-school class activities of dubious educational value.
5. The teacher, with the principal, should arrange transportation via school bus or other bonded carriers which are required by law to carry liability insurance.
6. The teacher should visit the community resource in advance to determine whether the educational benefits to be derived will make the trip worthwhile. Teachers should never assume responsibility for conducting pupils through a plant or industry themselves but should arrange to have the management supply a guide. As soon as the tour is ended, the teacher

should have the pupils return to school immediately, again by properly insured carrier.

7. The use of the parental permission slip (Fig. 9.10) informs the parent that community resource experiences that take pupils out of the classroom are an acknowledged part of the school program. It allows parents to have their children refrain from this kind of activity, if they wish. But the granting of parental permission does not absolve the teacher who takes his class out into the community, from exercising the same reasonable care he is expected to exercise in the classroom.

The teacher who works within the above suggestions will proceed with confidence and enthusiasm toward achieving valuable school and community relationships.

SUMMARY

Study of the environment in which we live is often overlooked as part of formal classroom activity. This should not be.

A systematic analysis of the community in which the school is located will reveal many valuable opportunities for learning at firsthand. Surveying community study possibilities should be cooperative projects for teachers in locating local industries, distributive agencies, service organizations, etc., which illustrate social processes and provide values important for implementing the school curriculum. Through parent-teacher-administrator planning, the resources of the community should be assayed in terms of valuable firsthand opportunities to discover useful information.

The community study experience takes two forms. On the one hand, members of the community may come to the classroom; thus a lawyer will talk to a social studies class, a biologist to a natural science class, an accountant to a commercial class, etc. On the other hand, the whole class or certain members of it may visit nearby plants in order to see heavy-industry processes, assembly-line procedures, automatic business-machine operation, etc.

Because of its realism, community study can become an effective first step in building understanding through real experiences which give additional meaning to subsequent and more abstract learning situations and heighten understanding of them.

The purposes of community study are as follows:

1. To provide opportunity for real experiencing through which to gain valid understandings.
2. To arouse and create interest. Few learners fail to be motivated as they contemplate and examine things, processes, and ideas.

3. To create backgrounds of experience which will give meaning to reading and simple research done later in the more formal study situations of the school classroom and library.
4. To provide backgrounds of experience which will stimulate students later to participate in class discussion, creative art projects, and written communication (writing letters, themes, stories, poetry, etc.).
5. To encourage and develop keenness of observation and care in observation, and insatiable curiosity.
6. To encourage active participation in community planning. Students can plan the community projects that grow logically out of field trip experiences. Such projects serve as bridges which lead from school experiences to community membership.

These purposes are seldom achieved in the absence of careful teacher guidance.

The outcomes of community study are well summarized in the discussion between Mr. Richards, a teacher, and Mr. D., a parent, which occurs in the film *Near Home* (Sound, B&W, 20 min., British Information Services):

MR. D. Well, I'm greatly impressed by all this, Richards. The youngsters have done a remarkable piece of work.

RICHARDS. They enjoy it—it's all I can do to keep up with them.

MR. D. Now, what do you think your youngsters are going to get out of it? I should say you've given them something very valuable . . . what one might call a real objective view of the town in which they live. . . .

RICHARDS. Yes, I knew that was the side of it that would appeal to you! But don't run away with the idea that they understand all this thoroughly—we don't expect them to. But they've been getting a basis of first-hand information that will still be there when they can make use of it—and they're developing, too, a habit of wanting to know, of finding out for themselves. Instead of learning geography, history, science and so on, all in watertight compartments, they've been finding out how everything fits together . . . and learning a lot of other things, too . . . things that will influence their whole life, and more. . . .[10]

Suggested Activities

1. List as many community study situations as possible which relate to your subject field. List both those which involve bringing representatives of the community to your classroom and those in which you take your pupils out

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[10] *Local Studies,* Ministry of Education Pamphlet No. 10, Prepared by the Central Office of Information, His Majesty's Stationery Office, London, 1948, pp. 81–82.

into the community. Since, as you do this, you will need to know more about your community, consider the following suggestions:

  - a. Consult the Chamber of Commerce.
  - b. Ask experienced teachers for help.
  - c. Study the local business directory.
  - d. Talk with lifetime residents of the community.
  - e. Interview the county agent and the editor of the local weekly or daily newspaper.

2. Visit some of the community resources which, after careful thought, seem to offer the greatest chance of enriching your subject area through the experience to be gained from seeing them. Take notes while you are there; gather data.
3. Make a list of the people you met during your survey who are willing to come to your classroom to talk to and be questioned by your students.
4. Plan a visit, tour, or field trip into the community. As you plan, keep a record. Devise your own record.
5. Arrange to preview such films as the following:
    - a. *Community Resources in Teaching,* Sound, B&W, 17 min., Iowa University.
    - b. *Field Trip,* Sound, Color, 11 min., Virginia State Dept. of Public Instruction.
    - c. *Near Home,* Sound, B&W, 27 min., British Information Services.
    - d. *Our Town Is Our Classroom,* Sound, B&W, 18 min., United World Films.
    - e. *The World in a Schoolroom,* Sound, B&W, 20 min., United World Films.
6. Arrange to carry on a long-distance speaker-phone interview. Consult your local phone company to arrange for equipment. Follow the suggestions made on page 247.

Bibliography

Allegheny County Council for Social Studies Teachers, *Let's Go on a Field Trip,* Allegheny County Schools, Pittsburgh, 1959.

Becher, Marshall, *Field Trip Handbook,* Dept. of Audio-Visual Instruction, Dearborn (Michigan) Public Schools (annual).

Bridges for Ideas: 5. *Using the Consultant,* Visual Instruction Bureau, Univ. of Texas.

Chicago (Illinois) Public Schools, *Resources in the Social Studies,* 1959.

Cuyahoga County (California) Public Schools, *Field Trip Handbook,* 1959.

Hartley, William, *Audio-Visual Materials and Methods in the Social Studies, 18th Yearbook,* National Council for the Social Studies, 1947.

Local Studies, Ministry of Education Pamphlet No. 10, Prepared by the Central Office of Information, His Majesty's Stationery Office, 1948.

Los Angeles (California) Public Schools, *It's Worth a Visit,* 1961.

Louisville (Kentucky) Public Schools, *Our Community Classroom,* 1955.

Milwaukee (Wisconsin) Public Schools, *Using Your Community Resources,* Curriculum Bulletin, Vol. 7, No. 1, Rev., 1955.

Olsen, Edward G. (ed.), *School and Community Programs,* Prentice-Hall, rev. ed., 1954.

"Random Falls Plan," *School Executive,* November, 1956.

Seattle (Washington) Public Schools, *Community Classrooms,* 1956.

Western Illinois University, *Knowing Your Community,* 1959.

CHAPTER 10

AUDIO LEARNING

A pupil in the language laboratory is learning to speak a foreign language; his progress is limited only by his own interest and capacity to learn. Nearby, a group of his schoolmates are following the fascinating instructions of an expert scientist hundreds of miles away who is telling them, via a classroom radio broadcast, exactly how to assemble a model electric motor. A short distance down the hall, other pupils seated at a listening table (Fig. 10.1) are absorbed in hearing a reenactment, in radio style, of the historic events that took place just before the Battle of Gettysburg.

Many audio learning experiences are available for day-to-day classroom use; furthermore, research studies have proved that they accelerate learning. Among them are language laboratories, educational radio, and prerecorded records, transcriptions, and tapes. These are the subject of the present chapter.

THE LANGUAGE LABORATORY

Many teachers believe that language instruction is best accomplished when the language is learned as it will be used, in the give-and-take of conversation with a well-educated person who speaks the language being studied. How many of us have gone through a year of sophomore conversational Spanish, only to find in our first visit to a Spanish-speaking country that no one speaks sophomore conversational Spanish? But when members of the Armed Forces return home they often have a basic understanding of a second or third language which they have listened to, imitated, and learned. Before children reach the primary grades, they have learned a language by listening, imitating, and repeating. The modern language laboratory provides similar experiences, but with greater economy.

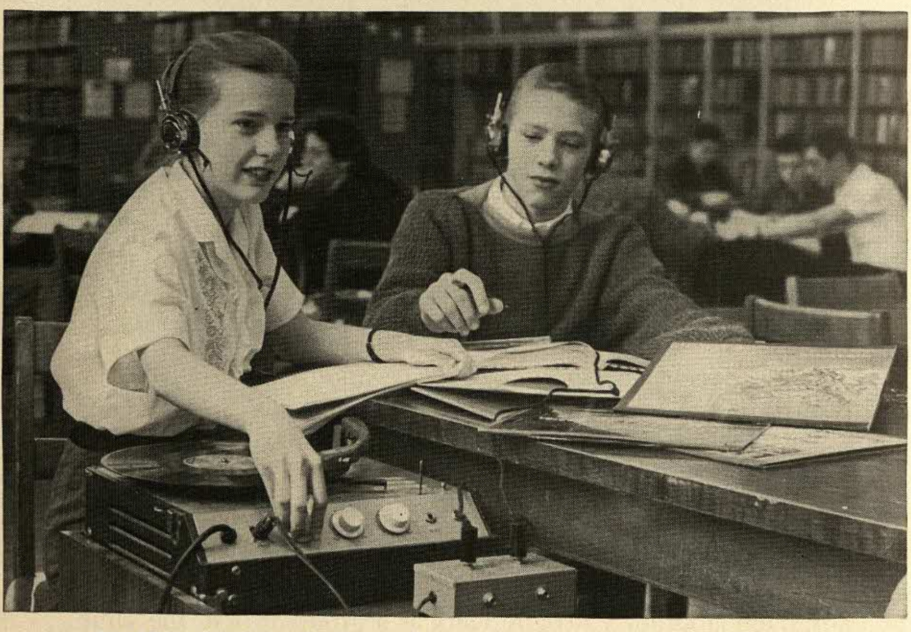


Fig. 10.1. Against a background of audio reenactment these pupils envision the events in history which become alive in their imagination. What independent study opportunities does this encompass?

A language laboratory is an electronic learning technique which enables the pupil to listen to words, phrases, or sentences, and to imitate and record these; in the playback he immediately listens to and compares his own recording with the original. Thus self-improvement through correction and practice continues, with the learner being able to discriminate between sounds, to associate his own language with the foreign language, and eventually to gain the ability to say the foreign words well and to know their correct meanings.

Language laboratories were initiated almost three decades ago by the Armed Forces as a means of training its personnel quickly and effectively. Originally records were used, but tape and tape playback equipment replaced them after the end of World War II. Tape recordings permit flexibility in arranging for the various procedures—drill, imitation of sounds by the student, self-evaluation made possible by immediately listening to his own tape recordings, and improvement based on comparing them with the model tape.

There are scores of ways in which a language laboratory can be set up and programmed. (Programming refers to the learning materials used, the methods of presenting information, etc.) Preferably the laboratory should adjoin the classroom so that it will be accessible to students at the point in their learning when they can profit most from it. This does not mean, however, that part of the classroom itself cannot be used as the laboratory. The study of a language is a social experience; hence another area should be provided for group discussion, for it is essential that teacher and students discuss specific problems that arise in connection with this work.

In most of the language laboratories today, tape-recorded materials are a primary means of acquiring ability to speak a foreign language. Points of grammar, background, and explanatory information are discussed, and question-and-answer sessions are held, during regular class periods.

Pupils in a language laboratory usually work as a group at first; the same taped lessons are used for all. Through their earphones or listening sets they hear introductory explanations and then an English word or phrase followed by its foreign equivalent. There is then a short pause during which the pupil imitates what he has heard, his own voice being automatically recorded. At this point the teacher, who is at a control center, may have each student listen immediately to the model tape and then to his own version. Thus the pupil can judge his own response at once, make corrections, repeat the procedure until he is satisfied, and then proceed.

Most language laboratory systems make it possible for the teacher to listen in on an individual pupil so as to judge the quality of his work. The teacher determines by means of tests how well the pupils know the meanings of the words, phrases, and sentences they have been listening to.

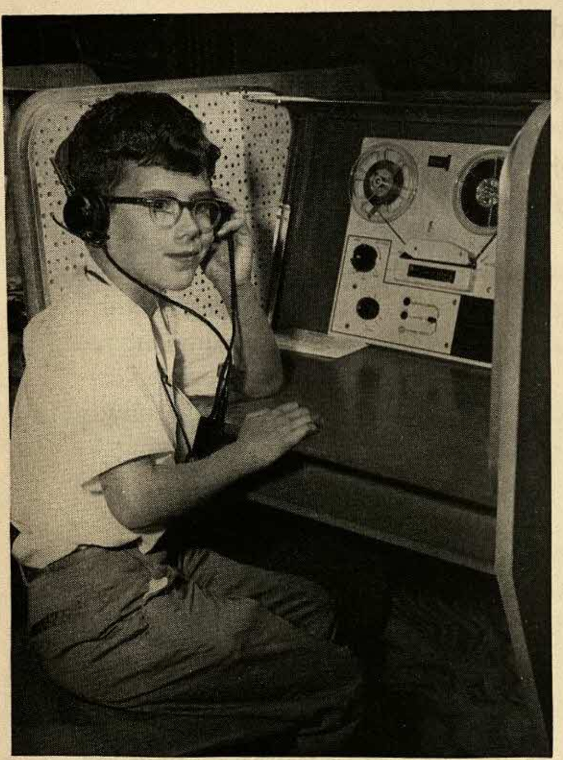


Fig. 10.2. Each pupil enters into a tutorial relationship with the teacher—actually, the prerecorded taped material. This is a sought-for kind of individualized instruction.

In an ideal situation, this approach to foreign-language instruction encourages pupils to proceed as rapidly as they can. As a result, the class may soon be strung out from very slow to very fast learners as they work in small groups or individually with the hundreds of prerecorded tapes provided in an effectively planned language laboratory course.

ROLE OF THE PUPIL

When a person is learning to speak a language, he must practice speaking it correctly. In typical class situations, one pupil may recite about once in thirty times, whereas a pupil in a language laboratory is listening about half the time and "reciting" the other half. This imposes exacting demands on pupils because it places a constant challenge before them. As we saw earlier, this learning procedure encourages trial, evaluation by means of self-appraisal, and improvement through practice with a model tape. Evaluation and reinforcement are immediate—no waiting until the next day while papers are being corrected. Meaning is assimilated in the back-and-forth references to English and the corresponding foreign-language terms. Perhaps the greatest advantage of this method is that, as has been said, it permits each pupil to proceed at his own pace (Fig. 10.2).

ROLE OF THE TEACHER

Although complete prerecorded language courses are available, there is a continuing need for additional materials, not available in the prerecorded tapes, which the teacher can plan and record (Fig. 10.3). For example, his pupils may need further emphasis on vocabulary and drills. He may pattern these additional tapes on the material in the textbook being used, or record short pronunciation and enunciation drills based on sounds or idioms. For the children who are advancing more rapidly than others, he may tape lessons adapted from more advanced foreign-language source books. If he gives the course another year he may use most of the tapes again, but others may need to be revised or replaced. Constant improvement of prerecorded materials should be his goal.

During laboratory sessions the teacher makes sure that the pupils are making the most of the taped lessons. He checks their morale just as he does in the traditional classroom situation, and he tunes in on any of the pupils to check the progress and quality of the work being done.

The old teacher-pupil relationship is changed. Instead of thirty children listening to one teacher, the language laboratory teacher can listen to one or all thirty pupils, each of whom is making individual judgments and responses (Fig. 10.4).

Interesting follow-up activities should take place after the lan-

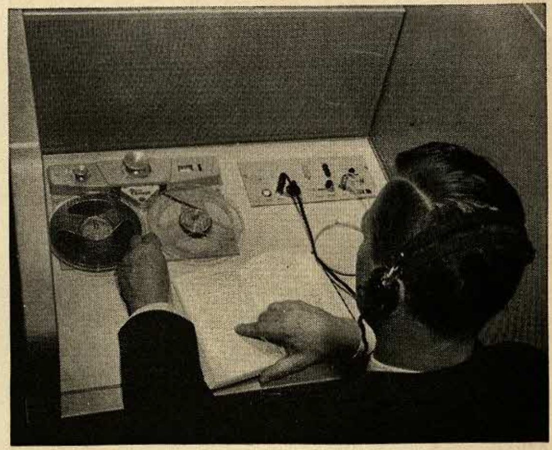
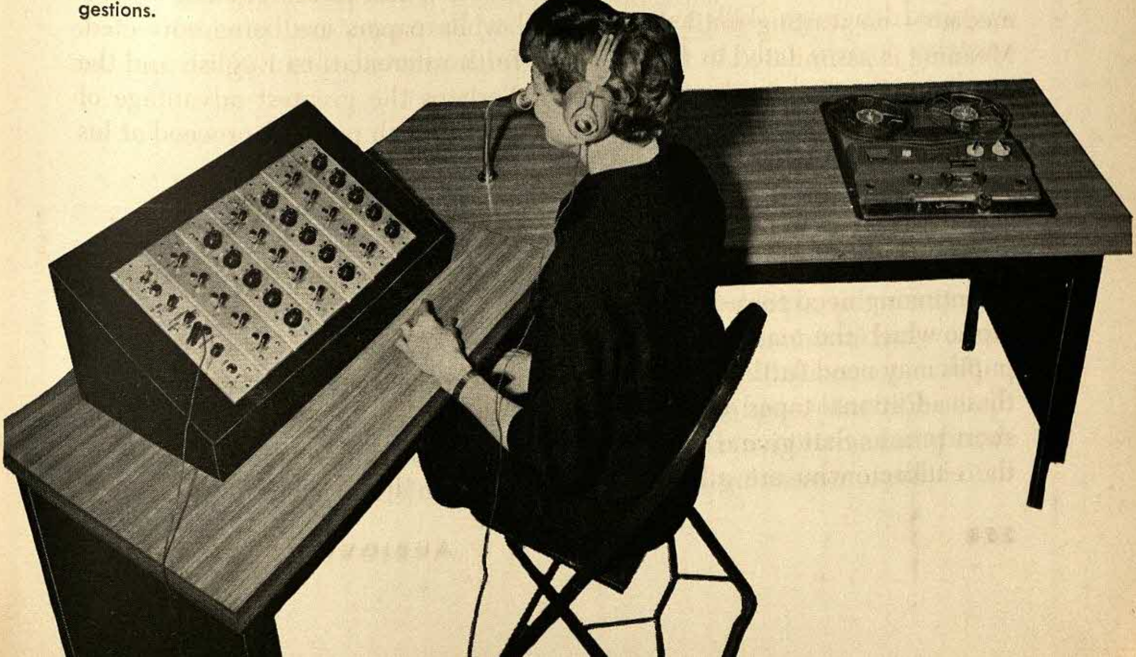


Fig. 10.3. Language laboratory materials may be prerecorded, or the teacher may create and record conversations, drills, or other word-phrase combinations for his class.

Fig. 10.4. This teacher is using electronic means to evaluate the work of a pupil. In this way a teacher can tune in rapidly on pupil after pupil to make evaluative judgments or needed suggestions.



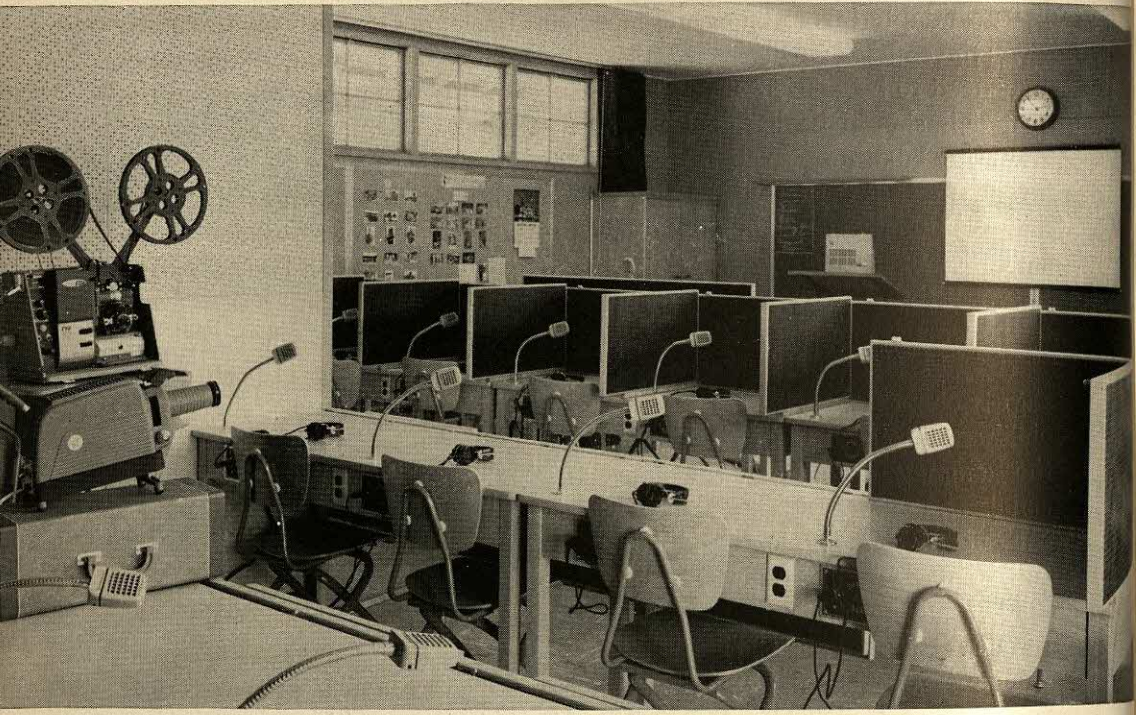


Fig. 10.5. The language laboratory should provide the means both of learning a language and of gaining an idea of the environment—the people, places, and things that are the "living" subjects of language study.

guage laboratory period. These may include conversational situations, games, and cultural drills that enable the students to try out their newly acquired language skills as a group. They have practiced privately, made mistakes known only to themselves, and corrected them. Now they are ready to take part in group activities.

THE LANGUAGE LABORATORY AND OTHER AUDIOVISUAL MATERIALS

Understanding the sociocultural backgrounds of the language itself is an important part of language instruction. In other words, there is more to learning a language than being able to speak, read, and write it. In providing for this aspect of foreign-language instruction, the role of related audiovisual materials should be considered (Fig. 10.5).

Films are available that depict sociocultural scenes in French Canada, Spain, Germany, and other countries. These films have foreign-language sound tracks that give most learners ample time to understand the language as it takes on meaning from the visual presentation itself.

Filmstrips with corresponding tape narrations are currently used widely. The prerecorded tapes give the filmstrips additional meaning. These tapes carry words, or simple, slow dialogue between the characters shown in the filmstrips. This combination of prerecorded tapes and filmstrips offers great promise for efficient foreign-language instruction.

Typical folk songs can be brought into the foreign-language laboratory by prerecorded tapes, as well as transcriptions and records. Similar audio materials give students a chance to hear the works of well-known native composers. This use of recorded music makes a learner's interest in good music a powerful motivational device in foreign-language study.

Many teachers provide a visual environment by using travel posters and pictures of cities, people, and costumes in the country whose language is being studied.

EDUCATIONAL RADIO

Today millions of pupils in elementary and secondary schools receive basic as well as enrichment instructional experiences through educational radio. During the last decade, some educators thought that radio would be entirely submerged under the wave of motion-picture and television educational materials and broadcasts. This has not happened.

Probably the greatest value of radio learning experiences is to be found in their enrichment possibilities. If listening situations are carefully planned, radio experiences can, through the combined effect of voice, environmental sound, and music, capture the pupil's attention and whet his imagination.

Through radio, master teaching in such diverse fields as science, social studies, art, music, language arts, safety education, etc., can provide enrichment experiences both to the pupil, in the form of additional useful information or techniques, and to the teacher, as models to be followed. New ideas about classroom procedures often supplement information per se when a carefully planned and produced radio "lesson" is used at the appropriate time in the local classroom. Educationally useful commercial programs include such presentations as news and special events broadcasts (opening of Congress, political conventions, inaugurations, etc.); since they are familiar to everyone they will not be discussed further.

Systematic use of radio in the classroom had its beginning in 1919. In that year, WHA, the state-owned University of Wisconsin station, completed sufficient experimental work to begin scheduled informational broadcasts to schools and communities in that state. On the heels of this remarkable development in broadcasting over WHA and shortly afterward over its sister station WLBL, other regularly scheduled broadcasts were begun over KDKA, Pittsburgh (the origin of the Pittsburgh School of the Air); WWJ, Detroit; and KUOM, the University of Minnesota station.

Today, vast areas of the United States can tune in on state and regional networks. Typical of the development of FM are New York State's Empire School Broadcast Service, the Indiana State School of the Air, the Wisconsin School of the Air, the Minnesota School Broadcast Service, and the Texas School of the Air. City facilities include carefully worked-out curriculum-coordinated radio programs in such places as Cleveland and Cincinnati, Los Angeles, St. Louis, New York City, Detroit, Chicago, Indianapolis, Omaha, Flint (Michigan), and a host of others.

Radio does not do the teachers' work; it supplements their planning activities and the materials locally available and enables pupils to explore things, ideas, and places more fully. That radio is an enriching audio experience was well brought out by William Levenson when he called it a new and vivid approach to education.[1]

CHARACTERISTICS OF GOOD SCHOOL BROADCASTS

The modern school broadcast is a carefully planned audio learning experience which utilizes resources beyond those available in the usual classroom. Because these broadcasts are usually prepared under the supervision of excellent teachers, school radio programs make possible outstanding and unusual learning experiences.

The radio writer, realizing that sound alone is the means through which radio-borne ideas are carried into the classroom, consults both teachers and subject experts regarding information which will lend itself to this means of communication. As a result of this mutual planning, existing programs reveal several characteristics that may be rather consistently identified with educational radio.

1. *The expert teacher and subject authority participate to bring an appropriate and enriching experience into the classrooms in the reception area.*

The St. Louis radio science series for Grades 4 to 6 is an example. Programs were planned cooperatively by science teachers, experts in the field, and specialists in radio program techniques. Many conferences were held during which the curriculum objectives for the three grades were discussed. On the basis of these discussions it was decided that certain of the objectives could be achieved by means of an educational radio program. Among these objectives were the following:

1. Each program would encourage study by the class before the radio broadcast itself.

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[1] William B. Levenson and Edward Stasheff, *Teaching Through Radio and Television*, Rinehart, New York, rev. ed., 1954, p. 26.

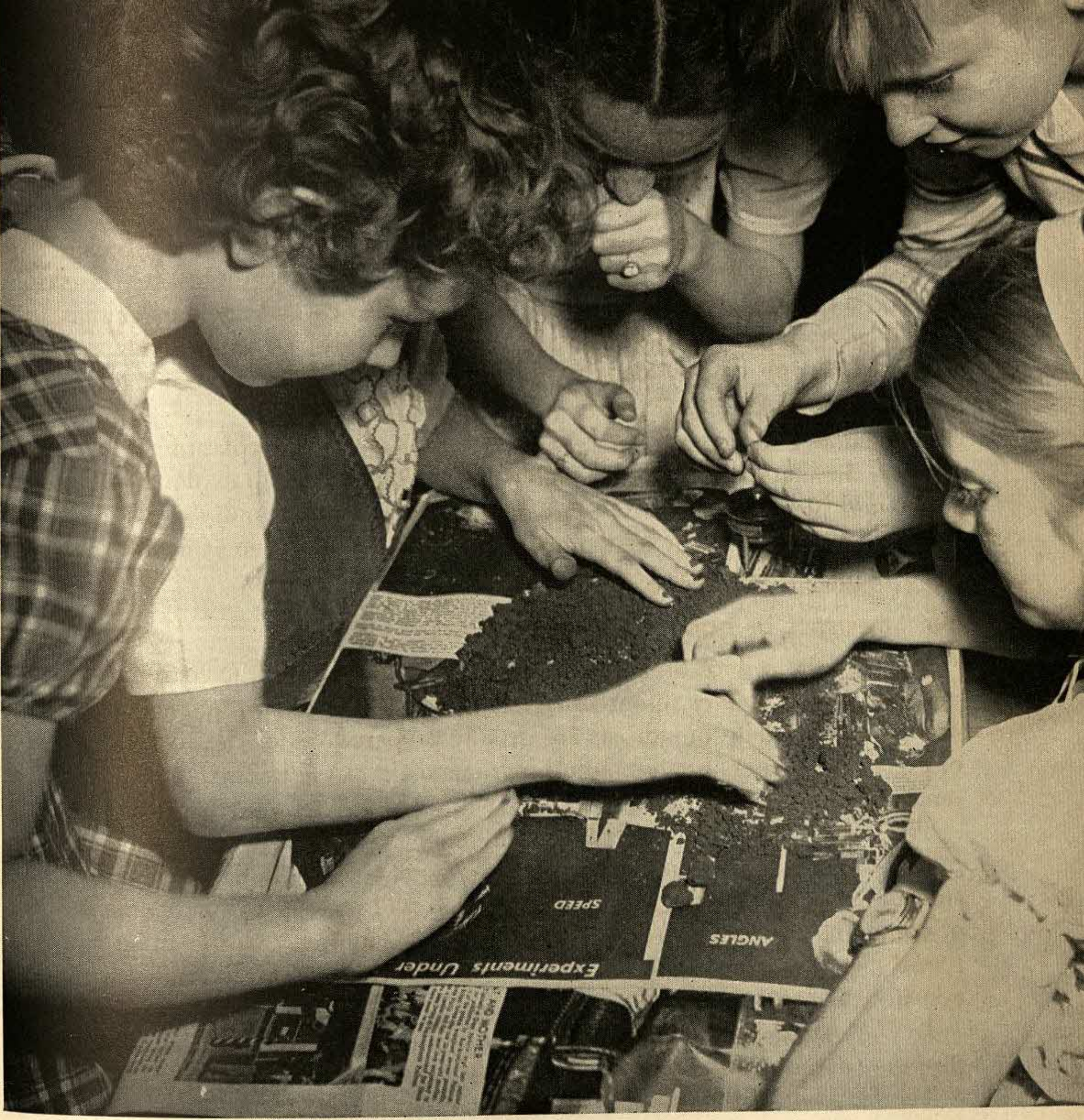

Fig. 10.6. After the broadcast the children question and discuss, and repeat the experiments if necessary. Pupil participation serves as an evaluation of the learning experience.

2. Each program would include carefully planned experiments which would be performed simultaneously in the broadcasting studio and in the classroom by two or three students who would act for the class during the broadcast.
3. The class would draw its own scientific conclusions during a utilization and discussion period *following* the broadcast (Fig. 10.6).

4. Programs would encourage children to become familiar with commonly used laboratory equipment and techniques.
5. Programs would develop in the children open-mindedness and "see for yourself" attitudes that are exceedingly useful in living.

Finally a radio lesson handbook was prepared and distributed to every teacher. The handbook described each program, listed the materials that should be on hand when the broadcast began, listed reference or classroom reading materials, and described what the student experimenters would do during the broadcast.

Because the broadcast itself was only one part of the entire classroom learning situation, other audiovisual aids which could be used were described by title and content and purpose. They included specimens, sound films, filmstrips, and books from the library that were to be in the classroom at the time of the broadcast. Directions for display board exhibits and chalkboard diagrams were also given.

2. *Educational radio broadcasts provide an immediate awareness of and an opportunity for "listening participation" in current history.*

The current events benefits of classroom radio are derived in two ways. The special events program can take the class to the floor of the Senate, or to the platform as the President of the United States is given the oath of office, or to an important session of the United Nations—all when these acual events are taking place.

The other way in which benefits are derived from current events broadcasts can best be described in terms of current programs, such as *News of the Week* (Wisconsin School of the Air) and *Current News* (St. Louis Public Schools). The real worth of the regular weekly or daily news broadcast for school children is the background information usually supplied by some well-qualified person who explains, in terms children can understand, the events leading up to the specific occurrence, and interprets its significance, its possible relationship to history, etc.

3. *The school broadcast is an effective means of presenting music and teaching appreciation of music.*

A medium that depends on audio communication lends itself naturally to the presentation of well-rehearsed, skillfully presented music of all types—classical, folk, and contemporary. Educational radio broadcasters can usually arrange for skilled performers to participate in programs planned around a definite theme, such as the music of other times, other lands, etc. One series of broadcasts, *Civic Orchestra Concerts*, broadcast over the New York State Empire Network by the Rochester Civic Orchestra, presents and explains symphonic music; *Music Time* and *Rhythms and Games* em-

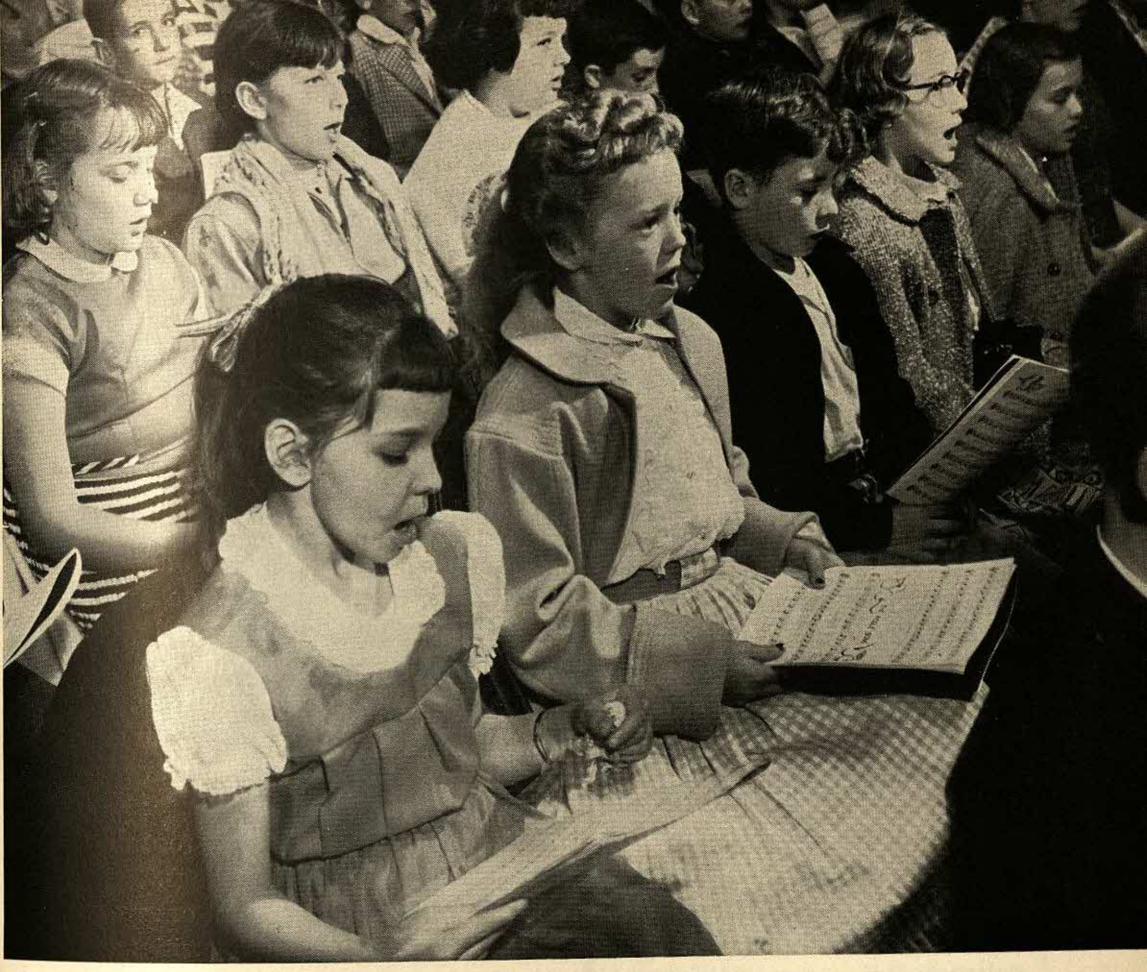

Fig. 10.7. What kinds of learning and attitudes are evident in this "radio sing"?

phasize folk music and other songs. *Let's Sing,* a Wisconsin program in which 75,000 children from all over the state participate, ends each season with a "sing" in Madison to which children come by the busload from all over Wisconsin for an afternoon of fun. Their appreciation of an educational experience, which during a semester-long series of broadcasts has enhanced their keen understanding and appreciation of good music, is evident (Fig. 10.7).

4. *Educational radio programs make it possible for experts to visit any classroom.*

Because radio broadcasts can bring valuable experiences economically into the most remote classroom, the expert—heretofore known only through news accounts—is now a "visitor" and resource person for any classroom. The political leader, the civic planner, the historian, musician, poet, or folk singer can provide enrichment experiences via classroom radio. At a cost of comparatively little time and effort, his half hour in the educational broadcasting station can be brought to a hundred thousand children in schoolrooms anywhere in the station's service area.

Radio programs created and distributed by educational broadcasting stations are an extremely practical way of increasing the effectiveness of capable people in all fields. At the same time the enrichment and readiness experiences they provide may open the door to better pupil achievement.

LIMITATIONS OF EDUCATIONAL RADIO

That educational radio programs have limitations must be recognized. AM broadcasts are often interfered with by static and abnormal weather conditions. This has been largely corrected by FM broadcasting, which almost guarantees static-free and uniformly high-quality reception.

Centrally broadcast educational radio programs are usually on a predetermined time schedule which coincides less and less with the real needs of the various local schools as the term progresses and as individual differences in accomplishment create wider and wider spreads between the various classes. This problem is further complicated by differences in curricula and courses of study which make it exceedingly difficult to plan programs that will serve the needs of all local schools.

The last two difficulties are being overcome to some extent by recording top-quality broadcasts for distribution via disk or tape recordings.

One of the most interesting developments is the establishment of several "tapes for teaching" services. Many of the major American universities and colleges—Minnesota, Michigan, Illinois, Utah, and Iowa, among others—are conducting a systematic review of existing educational radio program series; they have selected the most significant of these, and have transferred them to tape recordings. (See Source Lists, page 477.) Carefully annotated descriptions of these tape recordings are now available in catalogues issued by these universities. The Department of Audio-Visual Instruction of the National Education Association has prepared a composite catalogue of such materials.[2]

Teachers can rent these tapes at a very low cost, usually $.50 per 15-minute program. Or they may send in blank tapes on which the materials they choose are recorded; these tapes are returned to the school for permanent possession. A slightly higher charge is usually made for this service. This trend leads directly to a consideration of the role of recorded audio experiences in classroom teaching.

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[2] *National Tape Recording Catalog*, Department of Audio-Visual Instruction, National Education Association, Washington, D.C.

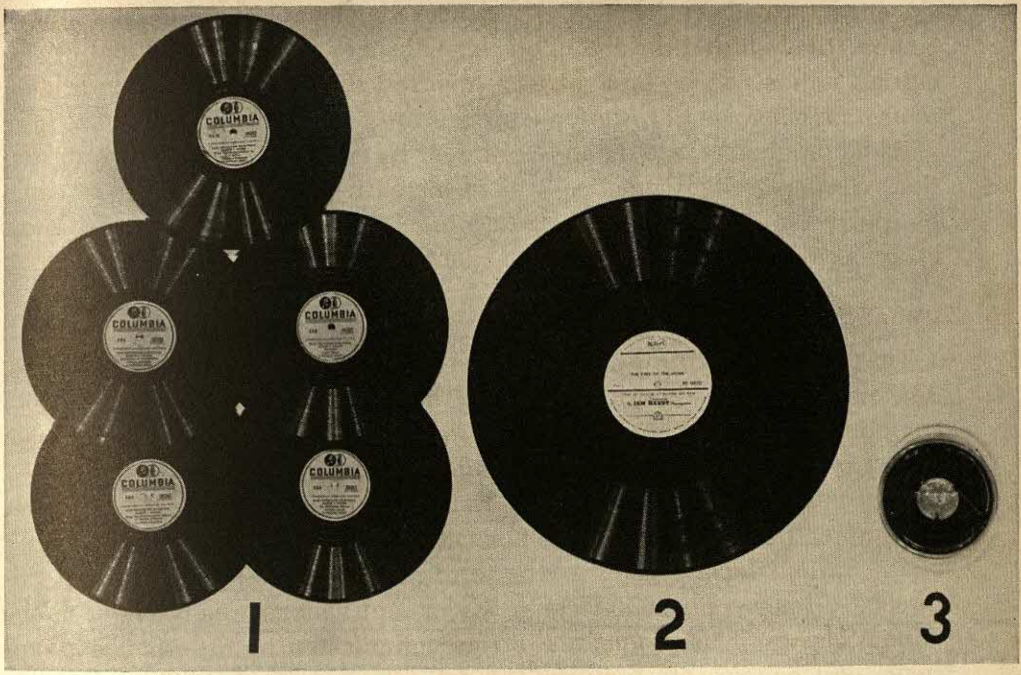

Fig. 10.8. Three forms of recording thirty minutes of material: (1) 78 r.p.m. recordings; (2) transcription; (3) tape recording.

RECORDED AUDIO EXPERIENCES

Like radio, both disk and tape recording is a means of bringing information to learners. Educational recordings present their information through audio imagery. This information may be mechanically inscribed on traditional recordings, on electrical or instantaneous transcriptions, or on long, narrow ribbons of tape (Fig. 10.8). In each case the practical purpose is to capture original sound and preserve it for later use.

Today the teacher who is investigating recorded information may find it in the form of ordinary phonograph records with which he has had long acquaintance. These records rotate 78 times per minute and can be played on an ordinary phonograph; their length varies from 3 to 6 minutes for one side, and their diameter from 6 to 12 inches.[3] Recordings can be stored easily in files such as are used for letters and flat pictures.

Transcriptions are similar to phonograph records except that they allow more economical use of the recording surface. Transcription disks rotate

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[3] Long-playing records at 45 r.p.m., etc., are beginning to be identified with educational materials. Effective beginnings are also being made in the production of 16 r.p.m. recordings for the purpose of preparing "talking books" in which some of the current children's and young people's classic titles are actually recorded in their entirety.

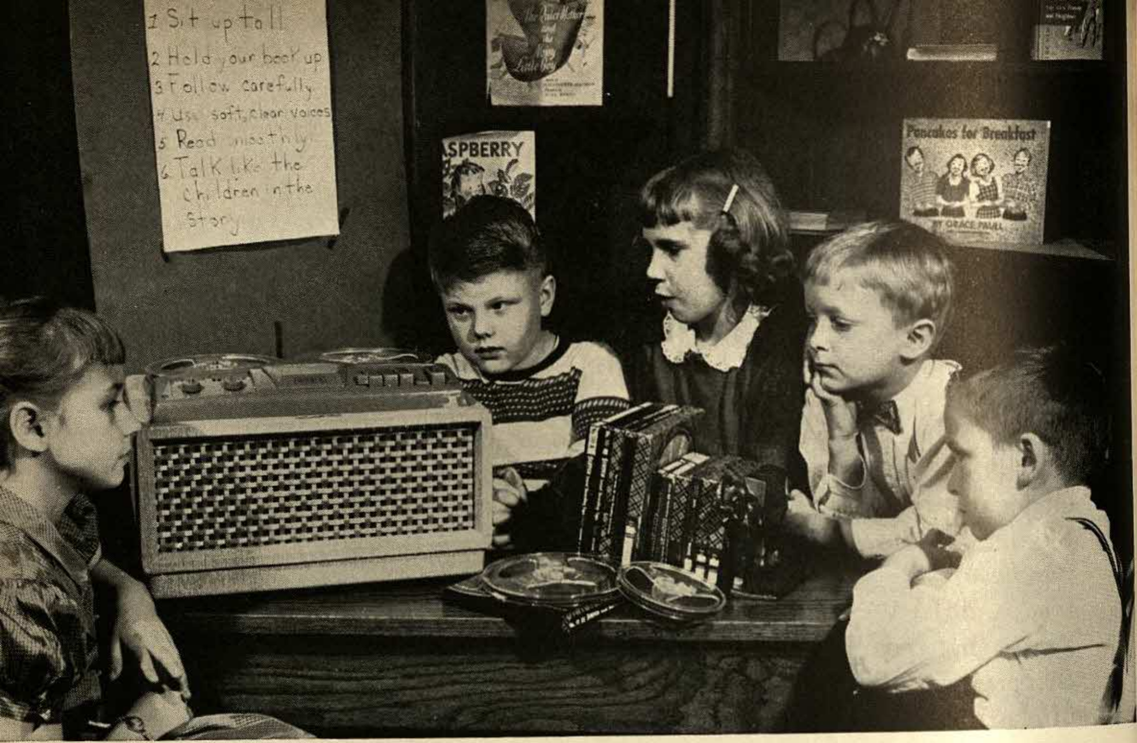

Fig. 10.9. The current trend is toward recording outstanding school broadcasts on tape. What classroom values does this practice hold?

at lower speeds (33⅓ r.p.m.), are larger, and consequently "hold" longer programs. Transcriptions first came into wide use for radio rebroadcast purposes. They vary in size from 14 to 18 inches. The 16-inch, the most commonly used size, carries approximately 15 minutes of program material on each side. As a basis of comparison, a 16-inch double-face transcription provides approximately as much material as do three double-face 12-inch records of the older and more traditional type.

Still another type of recording that is being increasingly used is made on a long tape that is coated with metallic oxide. This type of recording offers economy of cost, ease of handling, permanence, and freedom from wear, dust, and other deteriorating factors which affect records and transcriptions. Tape recorders play back at varying speeds, usually 3½ or 7 inches per second. The reels for the tapes are usually 5 or 7 inches in diameter.

Tape recordings may be made originally in the school (Fig. 10.9) or from radio programs or from "on the spot" current events situations. They vary in playing time from 30 minutes to two hours, depending on the make of the machine, the size of the spool, and the speed with which the tape is run through the machine.

In using records, transcriptions, and tape recordings, the teacher is primarily concerned with the information they contain and with the opportunities thus offered for realizing educational goals.

CHARACTERISTICS OF EDUCATIONAL RECORDINGS

Almost all the advantages ascribed above to the use of radio in the classroom apply equally to recordings. That this is true is seen in the fact that today increasing numbers of outstanding school broadcasts are available on records, transcriptions, or tape recordings.

Because of the nature of history, the recording which reconstructs history through dramatizations makes a primary contribution in this field. The *Enrichment Record* series in American history is a case in point.[4] It includes recordings with such titles as *Voyages of Columbus, Landing of the Pilgrims, California Gold Rush, Riding the Pony Express, The Louisiana Purchase, George Washington Carver, Building the First Continental Railroad,* and the *Wright Brothers.* The quality of these dramatizations demonstrates that recordings as well as educational radio broadcasts call for the cooperative skill of historian, script writer, and a teacher who is well versed in classroom methods.

Apart from these close parallels between radio broadcasts and recorded audio learning experiences, there are several characteristics of educational recordings that make them a unique audio experience, and therefore particularly valuable as a teaching material.

1. *Educational recordings can bring the actual words of contemporary political and socially important persons to the classroom.*

Since the middle 1920's, important news broadcasts have been recorded or taped by the major networks. Excerpts of these recordings are available for school use under such titles as the *I Can Hear It Now* series (1933 to the present; Columbia Master Works, Edward R. Murrow and Fred W. Friendly); *Voices of Freedom 1901–1950* (Educational Services); *Mr. President—FDR to Eisenhower* (RCA Victor); *The Red Badge of Courage* (readings from the book; Caedmon, New York); and *The Confederacy* (sounds and music for re-creating the Confederacy; Columbia Master Works).

Imagine how today's students feel when, studying the causes and events leading to the outbreak of World War II, they hear the actual voices of famous personalities of that time. On educational recordings the events leading to the war, of the war itself, and following it are now available for "listening" in history classes everywhere. In one of the *I Can Hear It Now* series, the voices of Churchill, Eisenhower, and Willkie are heard uttering the statements and prophecies which time has proved have altered the

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[4] Enrichment Records, 246 Fifth Avenue, New York 1, N.Y.

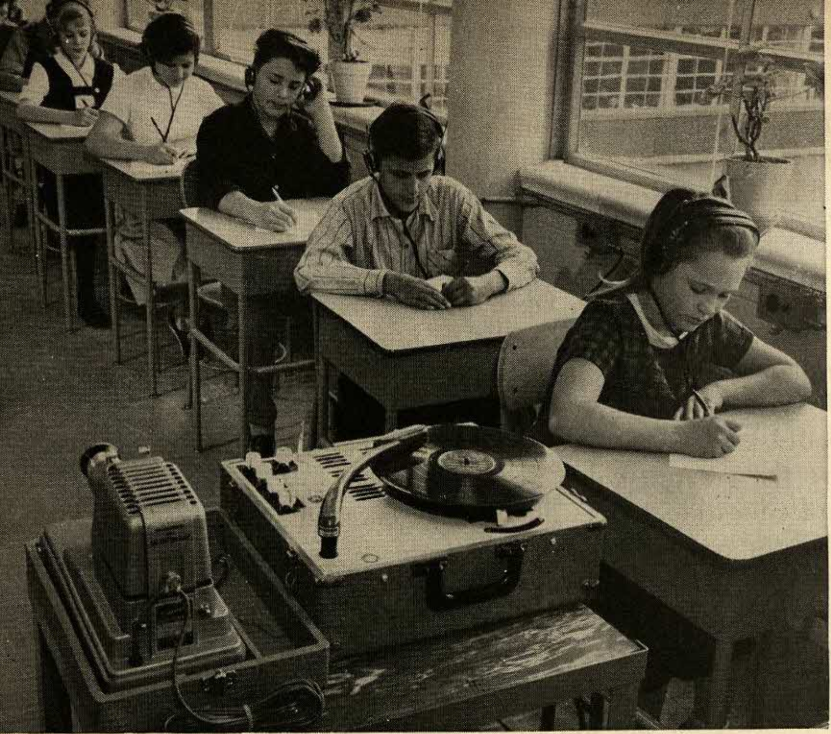

Fig. 10.10. These students are using recorded listening experiences as vivid, understandable source materials. This listening center is portable and can be moved into any of the classrooms as needed.

course of history. Think of the reactions of students in A.D. 2000 when, in studying history, they hear the voices of the leaders of nearly a century before!

2. *Barriers of distance and expense can be overcome by the use of educational recordings.*

The teacher of a junior-high-school English class overheard a pupil say, "I wish we could get the person who wrote this book to visit us and explain himself to us. I'd have a lot of questions to ask him."

Many of us have questions when we try to interpret an author's words. Such an experience as was desired by this junior-high-school student is today made possible in the *Columbia Master Works of Literature* series.[5] Through the audio experiences provided by this series of recordings, students can listen as an author not only reads selections from his works but in a pleasant and informal style describes his motivations in writing.

Similar recordings of audio experiences have been made by the National Council of Teachers of English.[6] Through these recordings teachers can arrange for their pupils to hear such poets as Robert Frost and Vachel

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[5] Available from local distributors of Columbia recordings.

[6] National Council of Teachers of English, 211 W. 68th St., Chicago, Ill.

Lindsay read their own poems. Such "listening" experiences provide further appreciation of poetry, but more important, they give students models of enunciation and reading which can serve as goals.

3. *The teacher has complete control of the planning and use of educational recordings.*

The recorded audio experience is a flexible instrument of instruction. The teacher can decide when a recorded audio experience should be used, and he should then plan carefully to create the best possible circumstances for its use (Fig. 10.10). Educational recordings are not subject to time control as are radio broadcasts. Thus the teacher can choose the time for "listening" that will insure the greatest value for the experience.

The preparation of educational recordings is now demanding the attention of publishing houses and record producers formerly concerned solely with the production of entertainment recordings. As a result, there are now available to schools carefully written, professionally produced recordings that can be "previewed" by the school before purchasing. The producers and distributors of these commercially prepared recordings are more and more realizing that, in order for the audio experience to be of the greatest value, the teacher must be able to select and, more important, completely control when and under what conditions recordings will be used. (See Source Lists, pages 477 ff.)

SELECTING AND USING AUDIO LEARNING EXPERIENCES

Some important procedures in selecting audio experiences include the following:

1. The teacher should, whenever possible, audition the material before using it. Although this is difficult in the case of radio, radio broadcasts are usually announced well in advance and are described in study manuals or summaries either sent to teachers or available on request from the broadcasting station.

2. In general, audio experiences should be judged on the basis of educational quality.

   a. Is the audio learning experience presented in an interesting, well-organized manner?
   b. Is the content authentic?
   c. Is it appropriate to the age level of the group that will listen to it?
   d. Will it make a real contribution that will be useful and effective in realizing learning goals?

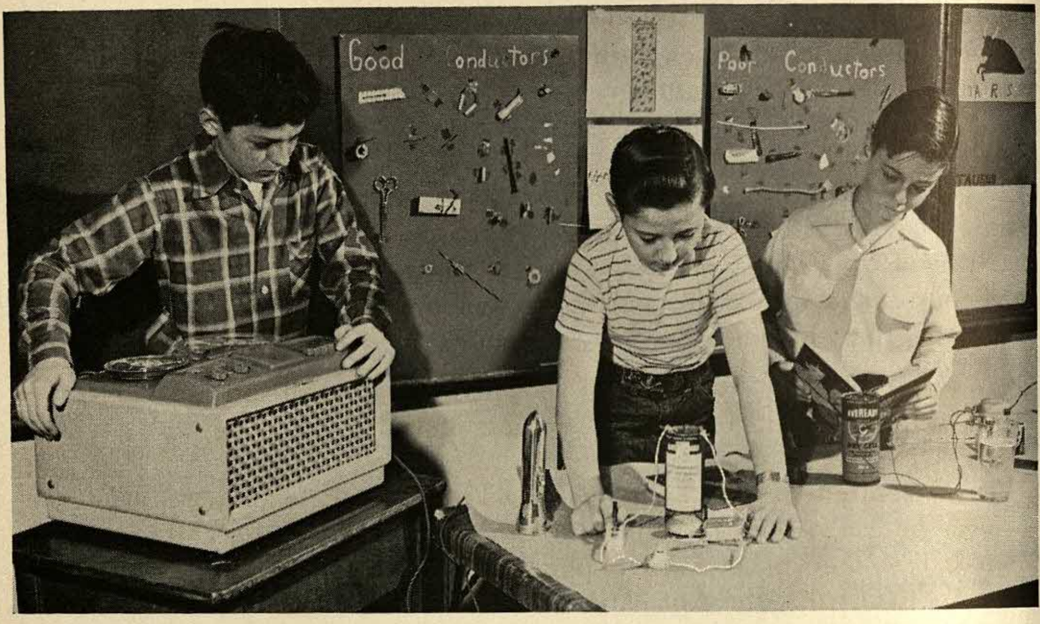

Fig. 10.11. Taping a broadcast usually enables a teacher to study it in order to provide the maximum possibilities for pupil participation.

3. When possible, the teacher should select materials that are accompanied by suggestions for use. In the case of the recording, such suggestions are usually in printed form. In the case of the radio broadcast, study helps are often part of the broadcast itself; however, these too may be in printed form. In some cases scripts may be secured in advance so that the teacher can plan more effectively.

4. Are related audiovisual materials available or suggested for use?

The teacher should have available in the classroom, during or after the broadcast or recording, all materials—films, slides, objects, specimens, maps, etc.—which will help children more completely to understand concepts developed during the audio experience.

In addition, these more general suggestions regarding selection apply. The teacher should select audio experiences which offer a promise of meeting the needs of the class. After he has investigated the program or recording, he should select only those that provide valuable and needed experiences. A teacher should never feel obliged to use a broadcast just because it is scheduled, or a record or tape just because it is handy.

Once a program has been selected, the teacher should assume definite responsibility for its carefully planned use in the classroom. While this is not always possible in the case of current events or news broadcasts, the day-by-day use of radio or recordings imposes definite utilization responsibilities on the teacher, which in turn yield results in terms of increased interest and efficiency of learning.

EFFECTIVE LISTENING

In general, utilization steps very similar to those described in connection with the use of other audiovisual materials apply to audio listening experiences. However, listening is a skill which responds well to suggestions for improvement; hence the teacher can help improve a pupil's listening skill by encouraging him:

1. To stop everything else—talking, looking around, daydreaming, having his attention distracted—and listen. He should think along with the speakers.
2. To concentrate on listening for the main ideas. As the pupil notes these ideas he can remember them by continually reviewing them. He may make *brief* notes of key words or phrases.
3. To try to visualize the explanation. He should do this mentally or, if possible, make simple sketches or diagrams which visualized the key points.
4. To ask questions only after he has given what he has heard his complete attention and thought.

In working for effective listening, the teacher should remember that a person ordinarily thinks faster than a speaker can talk; hence the listener has time to select, review, and organize what he hears. The usual rate of speaking is 125 words a minute; the usual rate of thinking is two or three times that.

An example of this is provided in a history class; the teacher is reading from a supplementary reference the following description of the Battle of Waterloo. As you read it, follow the four suggestions for better listening just listed.

BATTLE OF WATERLOO[7]

In order to get a clear idea of the Battle of Waterloo, we should imagine in our mind's eye a large capital letter "A." The left leg of the "A" is the road from a town called "X." The right leg of the "A" is the road from a town called "G." The crossbar of the "A" is known as the "sunken road." At the top of the "A" is Mont St. Jean. Wellington is there. General Jerome Bonaparte is located at the lower left leg of the "A." The right lower leg is where Napoleon Bonaparte is located. A little below the point where the crossbar of the "A" cuts the right leg is a town called "Q." At this point the final battle word was spoken. Here the lion was placed, the symbol of the supreme heroism of the Imperial Guard.

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[7] Adapted from a statement in listening improvement and used with permission.

The triangle formed at the top of the "A" by the two legs and the crossbar is the Plateau of Mont St. Jean. The struggle for this plateau was the whole of the battle. The wings of the two armies extended to the right and left of the two towns called "X" and "G." Beyond the point of the "A," beyond the Plateau of Mont St. Jean, is a large forest. As to the plain itself, we must imagine a vast, rolling country; each rolling hill commands the next; and these hills, rising toward Mont St. Jean, are bounded by a forest.

One of the tangible and measurable outcomes of your "listening" (in this case via reading) might be a simple "doodle," a sketch of the battleground, if you followed the third suggestion above. How close did your sketch come to the one shown in Fig. 10.12? Also, evaluate your listening by responding to the listening test above.

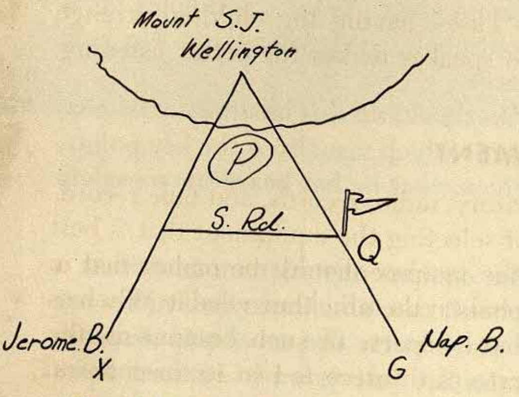

Fig. 10.12. One effective way to increase listening efficiency is to visualize key ideas. Keep such "doodles" simple so as not to let this activity interfere with listening.

For a better illustration of how listening habits may be improved in your own class, arrange a simple listening experiment using two classes or one class divided in halves, just so in your judgment the groups are approximately comparable. To one group read the description of the Battle of Waterloo, saying only: "Please listen carefully to what I am going to read to you." Following this, give them the test in the Suggested Activities at the end of this chapter. Score the test.

With the second group, discuss the four suggestions for better listening; then read the selection and test the group. Comparing the results of the two tests invariably indicates improved listening in the second group. Similar discussions for better listening should be held at intervals through the school year if lasting improvement is to be achieved.

Teachers will do well to adapt materials in their own subject-matter areas for the improvement of listening.

CREATING AN EFFECTIVE LISTENING ENVIRONMENT

The classroom is the place where listening activities ordinarily take place. As we saw earlier, in the case of language laboratory work, part of the classroom may be given over to special listening desks or to portable audio equipment; larger schools may have centrally located rooms devoted to language laboratory equipment.

Other audio experiences which call for record or tape playback equipment or radios should also take place in the classroom rather than in an auditorium, for teachers and pupils are accustomed to carry on work-study experiences in the classroom.

Ordinarily the area directly in front of the speaker is most effective for hearing. This is true because sound waves that come directly from the loudspeaker are less distorted than if they first strike reflecting surfaces. An extension cord should be used in classrooms where the only outlet is in the back of the room, so that the children will not have to turn uncomfortably to face the speaker.

By moving the speaker to the front of the room and away from sound-reflecting surfaces, good listening conditions can be provided without upsetting the entire classroom. In some cases, having the children arrange their seats in a shallow arc before the speaker makes for better listening.

SELECTING AUDIO EQUIPMENT

The appearance of the language laboratory, radio, records, and tape recordings brings with it the responsibility of selecting the equipment that is best for the particular use. Furthermore, the equipment must be maintained in good condition and be available to teachers at the time they need it. Whereas the teacher is most interested in the use aspects of such equipment, the audiovisual supervisor and administrator are interested in its mechanical excellence and cost.

SELECTING LANGUAGE LABORATORY EQUIPMENT

Equipment for a language laboratory ranges in cost from a few hundred to thousands of dollars. Whatever is chosen, it should have mechanical flexibility which permits:

1. The learner to listen to prerecorded materials.
2. The learner to record his own reactions and compare them with the prerecorded model.
3. The teacher to monitor the learners and to switch quickly from one learner to another.
4. The teacher to create his own learning materials and include them in the system.
5. The learner to be assured privacy and comfort so that he can work in an environment that is free of interference.

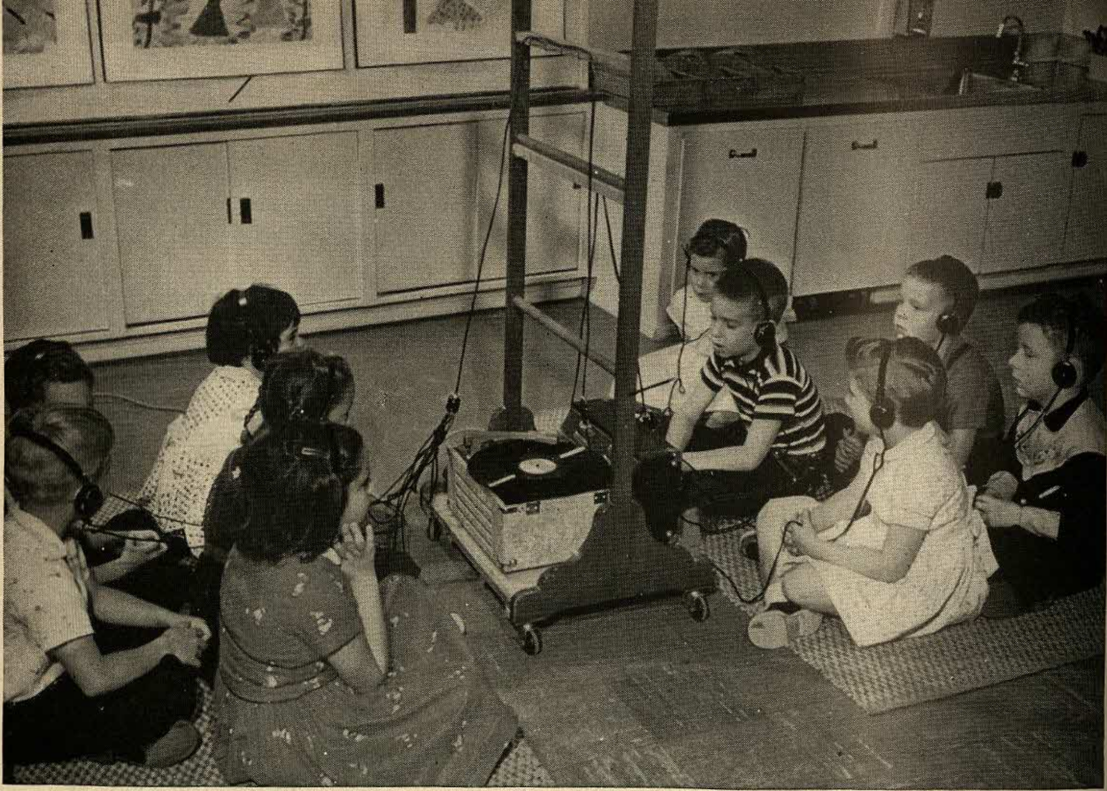

Fig. 10.13. Audio listening devices for use by small groups may be as simple as this portable playback which can serve as many as a dozen listeners.

The equipment for language laboratories usually includes tape recording and playback units. These may be portable (Fig. 10.13) or be installed permanently; the portable units can accommodate a few pupils, the others thirty or more pupils simultaneously. Because interest in electronics for language instruction is very high, many improvements are currently being made. Hence, when planning a language laboratory, the teacher and the audiovisual supervisor will do well to ask experienced language laboratory teachers and reputable audiovisual dealers and manufacturers' agents for advice.[8]

SELECTING A RADIO RECEIVER

Until recently amplitude modulation (AM) radio receivers were almost universally used. Today, however, increasing numbers of frequency modulation (FM) receivers are being used, and many school broadcasters have added FM or shifted from AM to FM.

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[8] See *Purchase Guide for Programs in Science, Mathematics, and Foreign Languages, Commission of Chief State School Officers,* Ginn, 1959; supplement, 1961.

Frequency modulation, or FM, has become a useful tool in education, on both the broadcasting and receiving ends. The Federal Communications Commission has reserved 20 FM channels for non-commercial educational use, thereby making it possible for schools to put their own stations on the air. There are approximately 130 such educational stations on the air.

As the result of these stations and the more ready availability of broadcast time for educational programs, schools are turning to FM reception. In congested city areas having a high local interference level, FM gives a static-free signal. In rural schools which formerly got interference from lightning, atmospheric disturbances, "high lines," transformers, electric fences, and other types of man-made static, FM gives clear reception.[9]

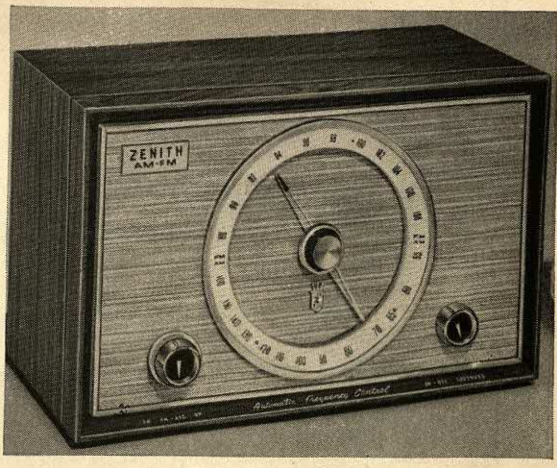

Fig. 10.14. Whatever the radio chosen, a clear bell-like quality in reception is essential.

A very important development in FM is the steadily decreasing price at which a high-fidelity receiver can be secured for classroom use. Such sets as that shown in Fig. 10.14 indicate the type of equipment currently available.

Much discussion surrounds comparisons of AM and FM receiving sets for schoolroom use. One acknowledged weakness of FM—namely, the short range of the FM signal, usually 75 to 100 miles—is being overcome through network or relay stations. Several states—New York, Indiana, Wisconsin, and Minnesota—have planned state-wide networks (in three states they are virtually completed) which call for booster stations to relay FM signals to make complete state-wide coverage possible.

The following criteria for selecting suitable classroom radios are suggested: (1) Until either AM or FM school broadcast facilities become universal, a combination AM-FM receiver should be chosen. (2) A low-cost set should be considered only if it offers high-fidelity tone reproduction, simplicity of operation, good volume, self-contained antenna, light weight, and operational safety. Fortunately several AM-FM radio receivers are now available which combine high-quality performance and low cost.

SELECTING RECORDING PLAYBACK EQUIPMENT

Many good playback machines are on the market today. Even casual acquaintance with recording equipment shows that a three-speed turntable,

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[9] From statement made in 1956 by Harold Engel, Division of Radio Education, University of Wisconsin.

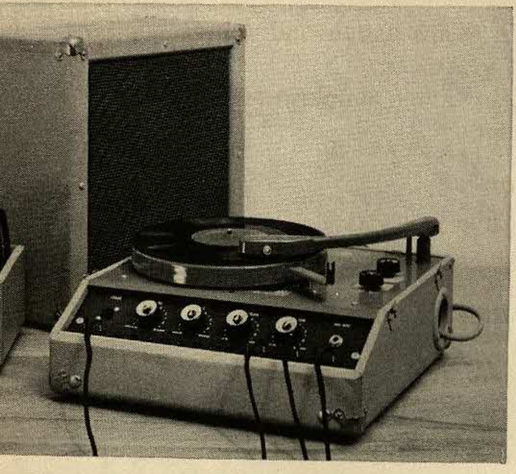


Fig. 10.15. The trend today is toward small, light-weight, high-fidelity playbacks, both record and transcription. This three-speed turntable is an example.

78, 45, and 33⅓ r.p.m., is desirable. Listening to records or transcriptions as they are being played provides an opportunity to detect noises in the mechanism proper, or surface sounds which interfere with audibility. A good turntable operates without sounds or noises which will compete with the material being played.

Consideration should be given to the reputation and service facilities of the dealer from whom the playback equipment is purchased. Reputable dealers are only too anxious to demonstrate what well-constructed, high-quality record players can do. Aside from this, the price of the equipment may be the determining factor. Most important of all, however, is the dealer's reputation for giving prompt service and guaranteeing the quality of the equipment he is selling to the school. A typical playback is shown in Fig. 10.15.

EVALUATING AUDIO LEARNING EXPERIENCES

The use of audio experiences in teaching is justified only when greater reality, interest, vividness, authenticity, and learning result because of them. In each area of school work, audio materials must be evaluated in terms of such outcomes. Hence it is desirable that, following a broadcast or recorded learning experience, the teacher and pupil evaluate what has happened.

For the Teacher

1. Did the audio material provide learning experiences which could not have been provided more easily with traditional materials?
2. Am I acquainted with all the sources of audio materials in my subject area?
3. Did I carefully preaudit the material I used?
4. Did I give attention to such factors as acoustics, seating arrangement, location of the speaker, and volume, while the class was listening?
5. Did I adequately prepare students for this listening activity by:
   a. Outlining vocabulary problems?
   b. Helping them know about what they were expected to accomplish?
   c. Encouraging discussion in which they could show their interest?

6. Did I encourage follow-up activities such as discussion and self-evaluation through testing?
7. Did I encourage follow-up projects such as reading, simple research, creative art expression, creative dramatic expression, etc.?

For the Pupil

1. Could I hear well enough to understand the material?
2. Did I know what I was to do before I began to listen?
3. Did I contribute any ideas during the discussion?
4. Did I help plan follow-up activities?

SUMMARY

Audio learning experiences are a means of enriching classroom learning opportunities. Included in these experiences are language laboratories, educational radio broadcasts, tape-recorded broadcasts, records, transcriptions, and tape recordings.

Regardless of the type of audio experience used, good listening carries with it certain responsibilities for the teacher. He should select audio material on the basis of its real contribution to learning. He must prepare learners for effective listening by helping them to create interest in the material. He should recognize and remove any barriers to successful listening. He should provide the best possible physical conditions for listening (seating arrangement, equipment, etc.) and he should arrange for evaluation and follow-up activities.

As awareness about audio learning materials increases, as assurance is gained in using these materials effectively, the capability of these materials to enrich classroom learning environments will be realized.

Suggested Activities

1. Select a suitable record or transcription and use it in one of your classes. Describe (a) utilization technique employed, (b) student reactions, (c) your own reactions to the effectiveness of this teaching aid.
2. Try the Battle of Waterloo experiment. To supplement questions you may want to prepare, here are a few multiple-choice questions for your use.

Questions

1. What was the Battle of Waterloo a struggle for? (A) Mont St. Jean itself. (B) The forest of Mont St. Jean. (C) The Plateau of Mont St. Jean. (D) The Town called "Q." (E) The sunken road.
2. Which of the following words will not help your understanding of the battle? (A) Plateau. (B) Plain. (C) Involuntary. (D) Triangle.

3. What is the most direct route between Mont St. Jean and the town called "Q"? (A) Along the sunken road. (B) Across the plateau. (C) Along the right leg of the "A." (D) Along the left leg of the "A." (E) None of the preceding.
4. What natural advantage did Wellington hold over Napoleon at the Battle of Waterloo? (A) Superior heroism. (B) Superior concealment. (C) Superior know-how. (D) Superior altitude. (E) Superior initiative.
5. Whom did the author of the passage sympathize with? (A) Wellington. (B) Napoleon Bonaparte. (C) Jerome Bonaparte. (D) The Imperial Guard. (E) None of the above.
6. Which of the following phrases contributes nothing to your understanding of the battlefield of Waterloo? (A) The town called "X." (B) The sunken road. (C) The plateau of Mont St. Jean. (D) Supreme heroism. (E) The town called "Q."
7. Where was Jerome Bonaparte? (A) At the point of the "A." (B) In the closed triangle of the "A." (C) Near the crossbar of the "A." (D) At the left lower leg of the "A." (E) At the right lower leg of the "A."
8. Where is the town called "Q"? (A) At the point of the "A." (B) In the closed triangle of the "A." (C) Near the crossbar of the "A." (D) At the left lower leg of the "A." (E) At the right lower leg of the "A."
9. Where was the "sunken road"? (A) At the point of the "A." (B) In the closed triangle of the "A." (C) On the crossbar of the "A." (D) At the left lower leg of the "A." (E) At the right lower leg of the "A."
10. Where is the plateau of Mont St. Jean? (A) At the point of the "A." (B) In the closed triangle of the "A." (C) Near the crossbar of the "A." (D) At the left lower leg of the "A." (E) At the right lower leg of the "A."

Answers

1—C; 2—C; 3—C; 4—D; 5—E; 6—D; 7—D; 8—C; 9—C; 10—B

3. Discuss the relative educational advantages and disadvantages of the record or transcription accompanied by teaching and pupil guides (a) printed separately and (b) appearing on the disk itself.
4. Compare the way you would use records and transcriptions with the way you would use school radio broadcasts.
5. Arrange with a local audiovisual equipment dealer to examine the latest audio equipment. Report your findings to your group.
6. Interview persons engaged in educational radio work to discover:
   a. The nearest sources of educational broadcast programs.
   b. Where the effective use of radio in the classroom may be observed.
   c. Listings of current classroom broadcasts.
   d. Where equipment may be seen in use or on display.
7. Investigate the means of recording current radio programs for future use in the classroom.

8. Plan to use a radio program in a specific teaching situation. Consider such things as:
   a. The characteristics of radio which make it particularly useful as a learning experience.
   b. The teacher's responsibilities in using a radio program effectively in the classroom.
   c. The responsibilities of the pupils before, during, and after the broadcast.
   d. Arrangement of the listening environment.
9. Arrange to preview the film entitled *To Speak with Friends* (Sound, B&W, 28 min., NEA), a very fine explanation of the role of the language laboratory in teaching a foreign language. Since this film is cleared for television use, you may wish to arrange to have your local TV station telecast it during Education Week or some other special event.

Bibliography

Audio-Visual Instruction, Department of Audio-Visual Instruction, National Education Association, Audio Issue, September, 1959.

Hocking, Elton, "Language Laboratories," *Nation's Schools*, February, 1961, p. 83.

Levenson, William B., and Stasheff, Edward, *Teaching Through Radio and Television*, Rinehart, rev. ed., 1954.

National Tape Recording Catalog, Department of Audio-Visual Instruction, National Education Association.

Noel, Elizabeth Goudy, "Good Listening," *See and Hear*, April, 1947.

O'Dell, Annie K., "Radio and Nature Study," *See and Hear*, March, 1949.

Teaching with Radio, Audio, Recording-Audit, and Television Equipment, Report of the Joint Committee of the U.S. Office of Education and the Radio-Television Manufacturers Association on the Use of Communications Equipment in Education, Du Kane Corporation, 1952–1953.

CHAPTER 11

THE TAPE RECORDER

OF ALL THE ELECTRONIC DEVICES presently available to an imaginative teacher, perhaps none offers him more versatile opportunities for creative teaching than the tape recorder. The tape recorder can be an assistant teacher; it can evaluate oral work done by pupils and inspire them to do better; it can be a world-roaming emissary which gathers useful sounds, reports, and messages; or it can be the means of re-creating carefully planned prerecorded audio tape dramatizations. In short, as the following "case histories" indicate, the tape recorder is a modern-day genie at the beck and call of the learner and teacher.

Just before the ten-minute warning bell rang, Mr. Stanton made the final adjustments on the recorder. He then arranged the room so that the students would not see the recorder as they took their seats. The microphone was well placed, but hidden.

When the period began, the students, one by one, gave what they believed were thoughtfully prepared two-minute summaries of free reading they had done the preceding week end.

As the last student returned to his seat, Mr. Stanton asked, "How would you like to hear yourselves?"

The silence was taken for assent, the recorder was brought into view, and an instant later the unmistakable sounds of the "reporters'" voices came from the recorder. There was complete silence when the listening began. Soon, knowing glances passed from identifier to identified as the "played back" reports went on.

Moments later the recorder was shut off and the teacher asked, "Well, what do you think?"

Spontaneous reactions came from every quarter:

"Was that what I said?"

"It couldn't be!"

"Mary was good!"

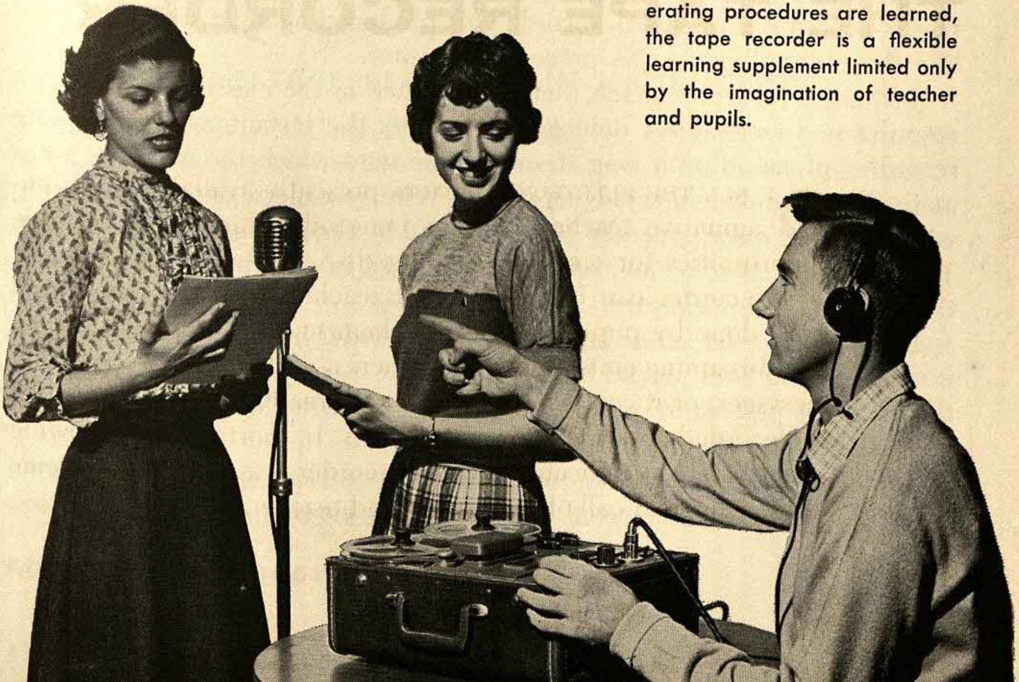
"I wasn't either! I stumbled!"

"I don't believe it—why I sound terrible."

"Is that really the way I sound?"

Comments came so fast that they were jumbled.

Fig. 11.1. Once simple operating procedures are learned, the tape recorder is a flexible learning supplement limited only by the imagination of teacher and pupils.



Soon a more orderly discussion got under way. Those *were* their voices. The students weren't satisfied. Something had to be done; admissions of need for improvement were unanimous. What could be done? Several students asked if they could use the recorder after school for practice and listening. Others wanted to try again. Then one of the girls said, "We should take lessons in enunciation." Another student suggested, "By listening to some of the recordings we had in history class, we could learn a lot about good speech habits."

During the next two weeks, everything suggested was tried—and more. The improvement in speech habits was noticeable.

In another situation, a class in instrumental music used a recorder for self-evaluation and criticism.

A clever dramatic coach, unable to make a point clear, used a recorder so that the class play's ingénue could listen to herself. She "heard" the point and set about correcting the inflections she had been using meaninglessly.

In still another situation, the "Radio 'Casters," a group of high-school upperclassmen, used a recorder not only to rehearse and listen but to record the final productions, one of which was good enough to be broadcast over the local radio station.

CLASSROOM RECORDERS

Several kinds and combinations of audio recording devices are in use. Originally most recording had to be done on disk recorders which converted sound waves, picked up by a microphone, into grooves of various widths and depths; these grooves were inscribed onto the surface of a plastic-coated disk or blank record. This produced a single record not unlike those described in the preceding chapter.

Next, wire recorders made their appearance in the classroom. The wire recorder is a mechanical device that permits the instantaneous magnetic recording of sound on a long strand of fine wire which the machine automatically unwinds and winds on spools. Wire recorders, once in relatively wide use, have quite generally been replaced by the magnetic tape recorder. This machine, its selection, operation, and use in classroom instruction, is the subject of this chapter.

The tape recorder is similar to the wire recorder in that the audio image is recorded and later played back by magnetic means. In the tape recorder, the magnetic pattern of sounds is carried on a plastic, Mylar, or paper tape that is coated with an iron oxide.

In making a tape recording, sound waves are picked up by a microphone and instantaneously converted into a series of varying electrical impulses.

These impulses travel to a small magnet which touches a moving ribbon of metallic-coated tape. This coating receives and retains magnetic impressions of varying strength which correspond directly to the original impulses set up by the sound waves of voice or music (see Fig. 11.2).

The tape can be rewound and played back at once. The invisible magnetic impressions excite the magnetic head and create electrical impulses which, after being suitably amplified, activate the loud-speaker diaphragm to produce sound waves identical to those originally set up during recording.

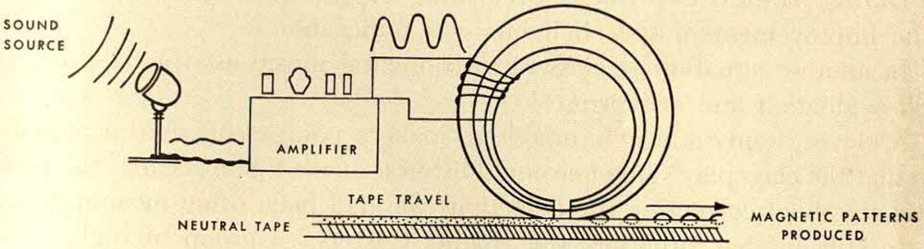


Fig. 11.2.

Tape recordings can be used again and again. A reel of tape was run more than 3000 times without any visible evidence of wear or any decrease in the fidelity of the sound.

If, on the other hand, an error has been made or the recording is no longer needed, the magnetic image can be erased in a matter of seconds. Erasing makes the tape magnetically neutral and the tape is then ready for immediate reuse for other recordings.

USING THE TAPE RECORDER IN INSTRUCTION

The tape recorder, in the hands of an imaginative and creative teacher, can be used in a surprising variety of ways to improve classroom learning.

The teacher and some of the more mechanically inclined pupils can quickly master the steps involved in placing the microphone correctly in relation to the sounds or voices being recorded, in recording and playing back (Fig. 11.3). Once this is done, the role and usefulness of the device are limitless. A few of many suggested ideas for effectively using the tape recorder are now presented.

IN LANGUAGE ARTS

The value of hearing oneself as others do, by means of tape recordings, was touched upon at the beginning of this chapter. This objective oppor-

Fig. 11.3. Classroom tape recorders are so easy to operate that almost immediately pupils forget the mechanics and recording becomes an interesting learning activity.

tunity for self-criticism is valuable during the entire span of school experience. Its value first becomes apparent in the primary grades when the youngsters attempt to read aloud; when they engage in "Monday morning reports" of the weather, week-end activities, and events at home; and also when telephone-answering techniques are recorded and listened to.

In the upper grades, panel discussions, reports of books read, discussions of the news, explanations of processes, and how-to-do-it accounts continue to demonstrate the true importance of *being able to get up on one's feet and express one's ideas verbally in a clear and well-organized manner.*

Children too often become so accustomed to a teacher's admonitions about improving speech or grammar that such remarks are no longer incentives to improvement. But the tape-recorded "voice," played back, frequently serves as a fresh new incentive. Errors of grammar and sentence structure and needless repetitions become painfully apparent when the child hears them committed in his own played-back voice.

"Do I sound like that? How can I have a better voice?"

"Do I talk *that* fast, that *slowly*, or with all those 'ah's,' 'er's,' and 'and-ah's'?"

No longer need the teacher alone make suggestions. With the tape recorder, the role of critic can include the class as well as the child himself who is being listened to via recorder playback.

In a closely related situation, group reports and discussions can become objects of improvement in which pupils participate. As both class and the discussers listen to a taped discussion, the entire group can make judgments and recommend their own "cures."

Other applications of the tape recorder in language arts include its use in self-criticism in reading, choral speaking, play reading, etc.

IN THE SOCIAL STUDIES

A primary goal of the social studies is to provide experiences which are so lifelike that they give the learner true understandings of people, places, and things throughout the world. The tape recorder makes possible the experience both of listening to others as they express their ideas and of exchanging spoken ideas with others. For example:

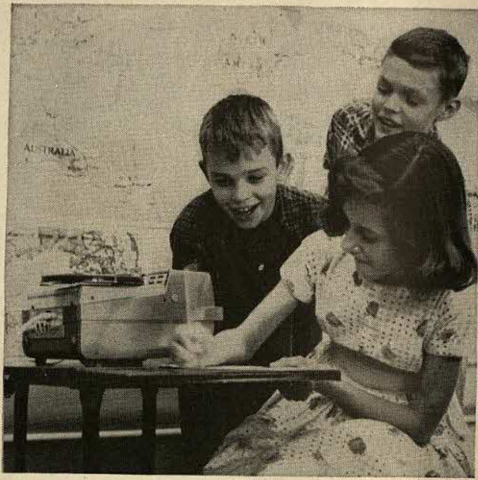
The pupils of School A are studying about the northwestern part of the United States. During their pupil-teacher planning session, the pupils reveal their interests and tabulate the following questions:

1. What sports and recreational activities do school pupils engage in during the various seasons? Do they have pets? What scout or club activities do they have?
2. How do the parents of the pupils make their living?
3. What does the countryside look like?
4. What is the school like? What kind of work is expected? What school clubs and sports are there, etc.?

The students study this list in order to improve the questions and decide which are most important.

Next, the pupils form several committees, each of them interested in one of the main series of questions. Each committee then prepares its questions for recording on tape. Finally, the actual tape recording is made and played back to give the pupils the experience of hearing themselves as others do. Usually the effect of this playback is to encourage the committee members

Fig. 11.4. The tape recording helps stimulate the series of desired performance reactions shown here. What learning processes are being enhanced here through using the tape recorder?



to rewrite, rework, and rerecord—all this in the interest of doing the best job possible (Fig. 11.4).

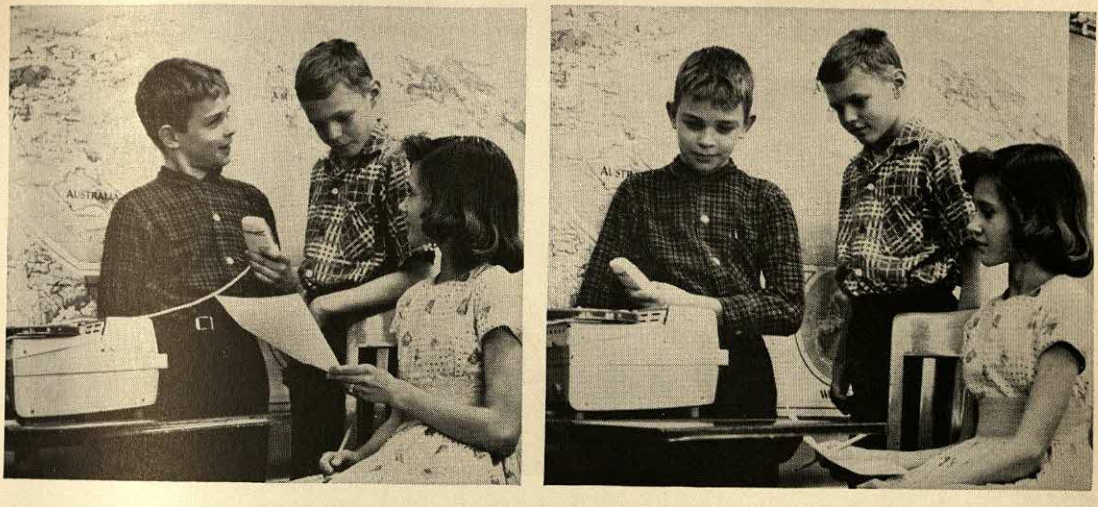
When the students are satisfied with the level of quality of the tape recording, it is ready to be sent to a school that is interested in exchanging tape-recorded questions and answers. Map study or a school directory enables other classes at the same level and with similar interests to be located, and preliminary letters are sent out by the pupil committees. This method of gathering source materials combines elements of social studies with written and oral language arts, and is currently in use in many schools.

Other more usual uses of the tape recorder in the social studies include the recording of important newscasts, of inaugurals, of field trip interviews, of interviews with important visitors to the school, long-distance debates between schools, etc.

IN MUSIC

In beginning band and orchestra work, the thrill of listening to how they sound through tape recording playback can be a great incentive to the pupils to listen, evaluate, and practice, all to the end of better performance. Recordings of individual vocal and instrumental performances, quartette and choral singing, all allow the individual or group to listen, learn, and improve. Older pupils can carry on recording and playback activities independently.

Today many school music departments have tape recorders set up on which soloists can record their work, then listen and practice. This procedure places the responsibility on the learner and gives him the opportunity to advance as rapidly as he wishes.



IN GUIDANCE ACTIVITIES

A guidance director reports using tape for anecdotal records which are "filed" in the student's cumulative record folder. At one-year intervals the tape-recorded student reports and interviews are spliced end to end (Fig. 11.5) and wound around a flat cardboard "reel."

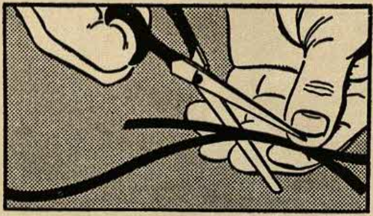
"Teachers," this director says, "are very willing to stop by my office, and as if they were chatting with me, record their comments on tape, knowing that I will add their 'tape' report to the progressively growing information record of a given student. At the time of graduation or on any occasion for listening, the tape record can be played back for parents, teachers, or pupil to listen to."

We are beginning to realize the many important uses that can be devised for the tape recorder. Suppose that when Johnny comes to kindergarten, a simple conversation with him could be recorded. Suppose that as he goes from grade to grade, his oral speech habits, oral reading, and conversations revealing his interests, likes and dislikes, ambitions, and relationships with home, school, and friends could be captured on tape, placed in his record folder, and on graduation be spliced together as an audio document of his school life and progress. Imagine the interest of his parents, and possibly an employer, in such a document.

For students about to start working after high school, the tape recorder is valuable. After the guidance director determines what kind of employment offers the best opportunities for the student, both the student and his instructor may engage in role playing, the instructor taking the part of an employer interviewing the student about a job. The taped interview is then played back for criticism.

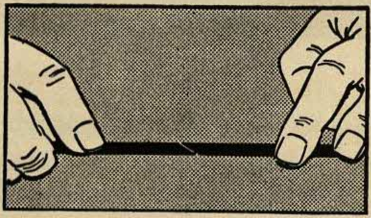
Here's how to make tight, noise-free splices:

1.



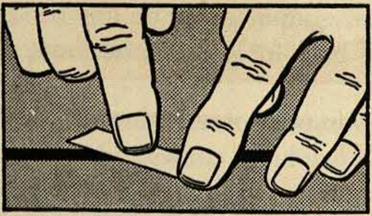
Cut tape at 60° angle with an overlap so ends will line up. (Cutting tape at 60° angle will eliminate detection of splice on recording.)

2.



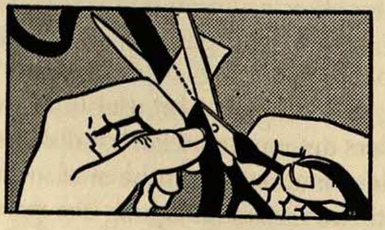
Align both ends of tape, uncoated side up (shiny on plastic, grey on paper.)

3.



Cover aligned ends with "SCOTCH" *Splicing Tape, evenly and securely.*

4.



Trim off excess splicing tape. (Cut into the recording tape backing very slightly as illustrated by dotted lines. This eliminates possibility of a sticky splice.)

Fig. 11.5.

Actual employers may be asked to appear before the class and conduct an interview with one of their own employees or a pupil. This also is taped for later study.

IN BUSINESS EDUCATION

Speed tests, vocabulary and spelling drills all lend themselves admirably to prerecording on tape. In typing and shorthand classes a tape recording, carefully worked out in advance by the teacher, can be used repeatedly to measure the speed and accuracy of various classes (Fig. 11.6).

In order to give his pupils experience in doing typing and shorthand in actual business situations, a commercial teacher arranged for each of fifteen local businessmen to dictate on tape three letters of varying length and difficulty selected from his own files. The resulting forty-five letters were a challenging and exciting variation from the regular class routine and gave the class a realistic idea of the requirements expected by business firms. Similar tapes for use in business education have also been commercially recorded.[1]

Other uses of tape recording in business education include taping business telephone conversations, employer interviews at local busi-

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[1] *Gregg Shorthand and Dictation* series, McGraw-Hill Book Company, New York.

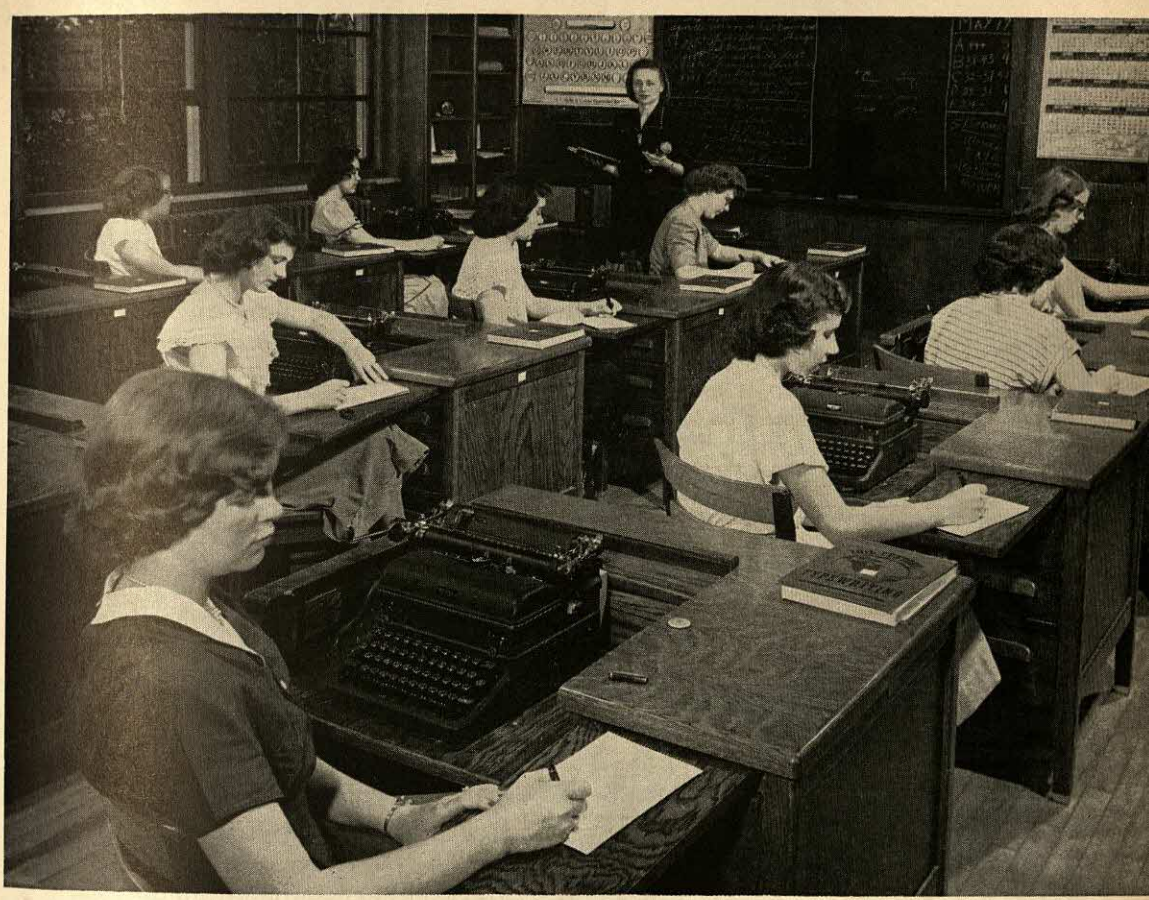

Fig. 11.6. A short speed test recorded during class can be used later as drill material to increase speed and accuracy in typing and transcribing.

ness firms, and both imaginary and genuine sales talks, the latter recorded by local sales persons.

IN DRAMATICS AND SPEECH

Unusual examples of speeches, debates, reporting, or dramatics are frequently heard on radio or television, and these can be useful in teaching speech or dramatics. Most tape recorders are equipped with a radio take-off line, a length of wire with a plug-in device at one end and twin metal clips at the other. By attaching the clips to the "voice coils" of the radio (ask your audiovisual supervisor or physics teacher for help) and then plugging in the tape recorder, the teacher can tape an address by the President of the

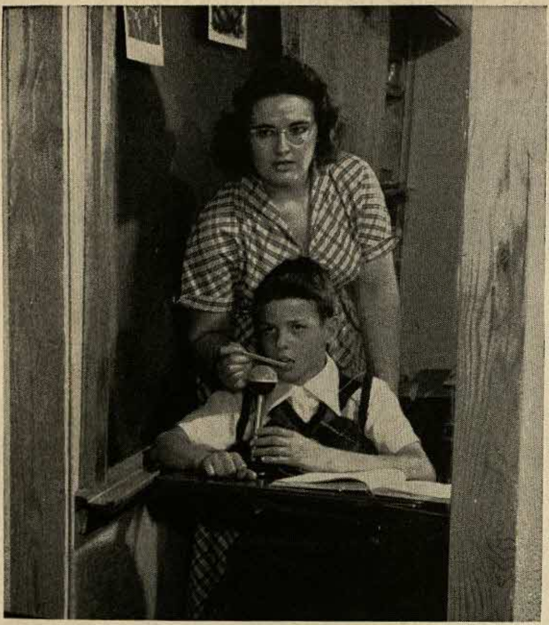

Fig. 11.7. What opportunities, unique to the use of tape recordings, can be developed in speech correction work?

United States, the audio part of a television drama, a panel discussion, or a well-delivered commercial.

Any of these may become teaching materials at the right time and under the right circumstances. Used as models, such tapes can help pupils make judgments about good speaking, clear enunciation, pleasing phrasing and voice intonation, vocabulary choice, and sentence structure.

When a tape recorder is used during a rehearsal of a play, the members of the cast can gain a vivid idea of their strengths and weaknesses from the playback.

In a large urban high school the confusion and noise in the halls were reaching unwarranted levels. The student council decided to act. Quietly but with great effectiveness they recorded typical hall and stairway noise while classes were changing. The recording was played back at the next meeting of the council and they were asked: "Do we want this in our school?" As a result the recording was played at the next school assembly and the same question was asked. A month later another recording was made—the reduction in noise was amazing.

PRERECORDED TAPES

Today, much audio learning material is available on prerecorded tape. This is particularly true in music where stereophonic sound gives the listener the impression of being in the presence of the actual orchestra or band. Stereophonic prerecorded tapes of high-quality performances represent the ultimate in electronic recording and pure sound playback unmarred by the surface noise or scratchiness often present with less effective means of recording.

Prerecorded tapes are particularly numerous in the modern-language field, as was said on pp. 266 ff. Because prerecorded tapes are relatively low in cost, they can be made part of the permanent collection in the school library (Fig. 11.8).

Taped programs are selected and used just like records, transcriptions, and radio programs. Audio programs on tape, however, are practically indestructible, for they are not subject to surface noise, scratching, or dust.

SELECTING AND OPERATING THE TAPE RECORDER

The tape recorder has captured the imagination of both teacher and manufacturer. As a result, well over 85 models are manufactured and distributed today.

Developments in this field over the past few years have made it possible for a teacher to secure tape recorders which in one compact unit include speaker, microphone, and recording and playback mechanisms. Curent models are simple to operate, rugged, attractive, and inexpensive. (See Fig. 11.9.)

The teacher should ask for a demonstration in order to determine which recorder will be best for the type of use he anticipates. Because any equipment may get out of order, service that insures the quick return of the tape recorder to working order is imperative.

In addition, the teacher should ask such questions as these when selecting a tape recorder:

1. Is the tape recorder simple to operate?
2. Do the voices or sounds on the playback closely approximate the original in tone and quality? Is this true of small groups as well as of individuals?
3. Will the recorder operate at both slow and fast speeds?
4. Is the recorder easy to handle? Portable?
5. Will the dealer provide overnight service in case of breakdown?
6. Will the dealer show the teacher and some of his pupils all they need to know about operating the equipment, placing the microphone, etc.?

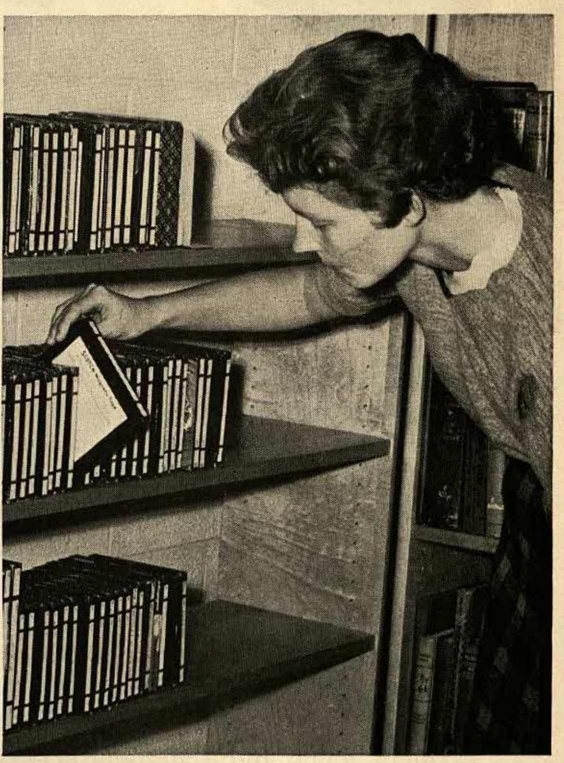

Fig. 11.8. The school library is often a source of locally owned collections of prerecorded tapes. In such cases a pupil may take a tape out as he would a book for use as a study reference. Other tapes are used for class listening.

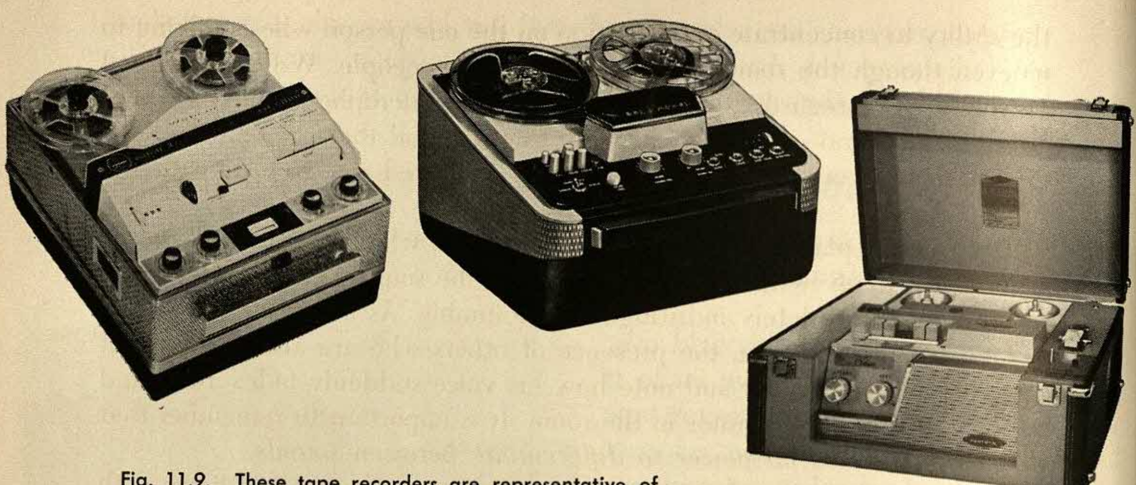

Fig. 11.9. These tape recorders are representative of those currently used in classrooms. *Left to right:* Webcor; Bell & Howell; Graflex.

OPERATING THE TAPE RECORDER TO ACHIEVE "PRESENCE"

With the appearance of each new instructional device the teacher assumes added responsibilities. He must learn new techniques when he uses tape-recording equipment, but he knows he will be well rewarded in terms of increased pupil achievement.

In using a recorder in the classroom, the teacher is concerned with whether the playback sounds "real" and "natural." When the recorder is used for evaluation, the recorded sounds must duplicate the original as completely as possible; in other words, the recorder must achieve "presence."

Presence or lifelikeness in the recorded image is essential if the recorder is to be used in school work. If the vocalizations of students, either word of mouth or song, are to be evaluated, presence must be attained in recording. If choral work and instrumental and orchestral arrangements are to be evaluated, if music is to be analyzed in terms of timbre, pitch, intonation, volume, or expression, presence must be attained in recording. Attaining naturalness in recording is not so technical a problem as to be outside the ability of the teacher.

The teacher will soon discover that there is more to using a recorder than merely putting a microphone in front of an individual or group. To attain presence, he must know something about microphone placement.

In placing the microphone, the teacher is at first likely to depend on his own hearing. He does not realize that sound heard by two ears is entirely different from that "heard" by a microphone. Our ears and mind possess the ability to concentrate our attention on the one person who is talking to us even though the room is filled with chatting people. We have trained ourselves to disregard extraneous sounds. The microphone, on the other hand, is monaural—as if one ear were listening and that ear made no discrimination. Every sound that reaches it is picked up. Not so with the human ear.

To test this, place a microphone in a room in which a crowd of people are talking freely with one another; record the sound. The result will be a jumble—a completely indistinguishable jumble. As a further test, while talking with a person in the presence of others who are also talking, put your hand over one ear and note how his voice suddenly fades away and mixes with the other sounds in the room. It is important to remember that *a microphone has no power to differentiate between sounds.*

In placing the microphone, move around to various spots and listen with one ear. In this way you will hear much as a microphone does. Thus you will be able to judge what it will "hear" and accordingly place it to best advantage.

While you are deciding where to put the microphone, roughly divide the space that will be occupied by the speakers and performers into five or six imaginary squares. Put the microphone in the center of each of these squares and test the results on the recorder. You will soon become exceptionally good in judging about locating the microphone.

The microphone should be four to six feet away from any hard surface that reflects sound. It should be head-high on a small microphone stand or similar support. Visualize the area in front of the open face of the microphone as a "cone of reception" area, and within this cone experiment with recording and playback to acquire a feeling of the range of pickup and the quality of reproduction characteristic of the microphone. Too low or too high a recording level will actually change the identifying qualities of the voice; a low recording level for a speaker who is only inches from the microphone will eliminate almost all extraneous noises; a gusty voice will be recorded better if the person speaks slightly across the face of the microphone, etc.

Although classrooms vary, the schematic layout shown in Fig. 11.10 embodies general suggestions for tape recording in the classroom. Experiment—that is, record, play back, reposition pupils, etc.—until you discover the location of both microphone and pupils that gives maximum results.

ACOUSTICS

The acoustics of the room or recording area should be studied. Ordinarily the microphone should be located a good distance away from reverberating

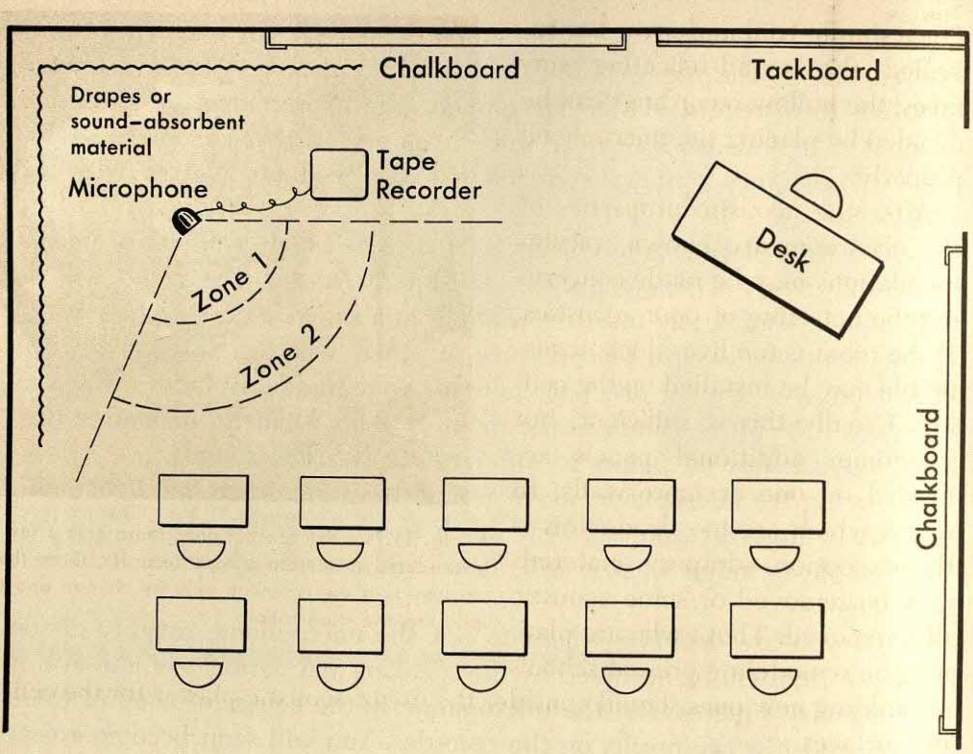

Fig. 11.10. A schematic plan for classroom tape recording. The pupils leave their seats and take positions around the face of the microphone. Pupils with weak voices usually stand from 15 to 20 inches away from it (zone 1); those with stronger voices stand farther away (zone 2).

surfaces. Corners of the room should be avoided, as should proximity to hard, flat surfaces.

You can soon distinguish between a "live" room and what is known as a "dead" room. Unfortunately, most teachers have to contend with classrooms which have poor acoustics. The usual classroom is "live," characterized by hard plaster wall and ceiling surfaces. A "live" room is likely to be filled with reverberated or echoed sound waves which cause confusion as they enter the microphone. Such a classroom can be made less "live" by drawing the shades, or, if there are draperies, spreading them out over as large an area as possible. Wall hangings, cloth-covered screens, and other surfaces which can be hung temporarily with sound-absorbing material will also help remarkably.

In contrast to this is the "dead" room. Such a room may be crowded with rugs, draperies, and overstuffed furniture, and its ceilings and walls may have good acoustic properties. Here, however, there is an undesirable amount of sound absorption which results in "hollow barrel" recordings.

Once simple trial and error has revealed the sound-reflecting surfaces, the hollow recordings can be avoided by placing the microphone properly.

After the acoustic properties of the classroom are known, recommendations may be made concerning the bettering of poor acoustics. If the room is too live, thick acoustic tile may be installed on the ceiling. Usually this is sufficient, but sometimes additional panels are needed on one or more walls. In rooms which are too dead—this is the exception—drapery materials may be removed or some acoustic tiles removed. Those who are planning on remodeling present schools or building new ones should consider the use of acoustic plaster for the ceiling surfaces.

Fig. 11.11. The teacher need learn only a few simple procedures to operate a tape recorder. Once these are mastered, its use is limited only by his own and the pupils' creative imagination.

RECORDING LEVEL AND TONE

Recording level refers to the volume at which a recording is made. The higher the volume control is set, the greater the pickup range of the microphone.

A teacher complained that playground noises outside the building were being recorded along with the songs two children in the classroom were singing. Obviously, the volume control was set at high or maximum, with the result that the mechanical ear, the microphone, was reaching out far beyond the walls of the classroom to gather in every sound. To help here, most machines have visual signals which wink or glow when the recording level is correct. But the best procedure is to experiment with volume settings until good results are achieved.

Tone refers to the treble or bass quality of the voice, music, or other sounds picked up by the microphone and recorded. The tone quality can be controlled by adjusting or rotating a tone control on the tape recorder. Short test recordings and a little experimenting—perhaps more or less treble or bass—will reveal when the tone setting is correct.

Recording level and tone are so flexible that the tape recorder has many special uses. The sounds of a busy business district, the whir of machinery in a manufacturing plant, the sounds in a dairy building—even bird calls—may be tape recorded for classroom use.

STEREOPHONIC RECORDING

Stereophonic recording is a process in which two or more microphones and loud-speakers are used so that the quality of the sound recorded and reproduced is close to that of the original. For example, in recording a school orchestra or a language arts choral speaking group, two microphones may be used, each one recording only one important section of the entire group. Thus in Fig. 11.12, M1 (microphone 1) will pick up primarily the sound of the string choir and part of the percussion and the brass; M2 will record the sound of the woodwinds, etc. The recording will be played back over a stereophonic tape playback, in which the sounds picked up by M1 are reproduced by one corresponding loud-speaker, and those picked up by M2 are reproduced by a second loud-speaker. In the playback the relationship and emphasis of the sounds are reproduced so that the actual physical position, quality, and volume in the original performance are closely duplicated.

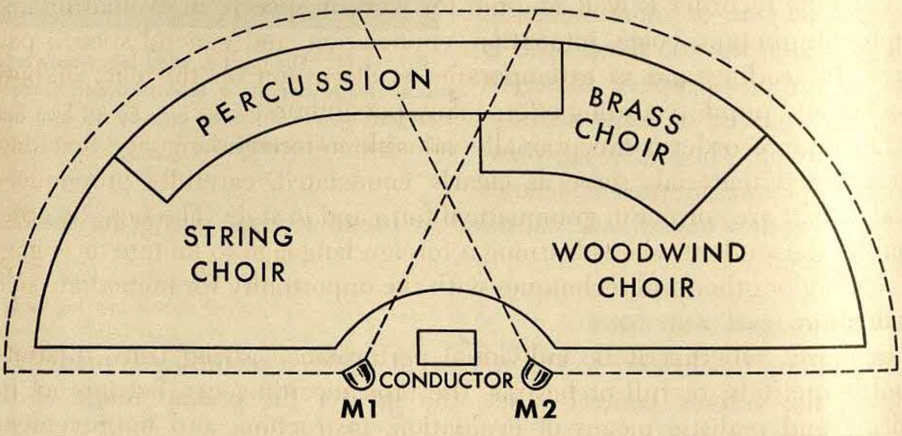

Fig. 11.12. Stereophonic microphone placement depends on the size and characteristics of the classroom and the sound qualities to be recorded. The teacher should experiment until he finds the placement that produces the best results.

The listener is usually impressed by stereophonic recording because of the great presence or lifelikeness in sound reproduction it achieves. He can close his eyes and solely by listening identify sounds as to their type and location—and even change of location, if this has occurred.

Listening to stereo recording is not only a remarkable aesthetic experience, but one that enhances audio learning particularly in cases where identification of location, emphasis, and relationship of qualities of sound are important factors. Stereo reproduction by tape is efficient in that it eliminates both surface noises and the noises due to mechanical sound reproduction techniques. Stereo tapes are not subject to rapid deterioration and hence can be used over a long period of time.

SUMMARY

The tape recorder makes it possible for teacher and pupils to hear themselves as others hear them. The tape recording instrument has as many uses as the ingenious teacher finds need for. By means of tapes he can secure instructional control, evaluation, and analysis in a degree heretofore impossible.

The tape recorder is well adapted for work in speech, in evaluating and improving diction, voice, intonation, enunciation, and general speech patterns. In reading and in extemporaneous discussion on the part of both teacher and pupil, recording offers many possibilities.

The tape recorder is exceptionally valuable in foreign-language teaching. Prerecorded materials serve as clearly enunciated, carefully pronounced models that are correct in grammatical form and in style. The tape recorder enables the student who is learning a foreign language to imitate or engage in reading or other oral techniques with the opportunity for immediate self-evaluation.

In music, whether it be individual performance, string trios, quartets, double quartets, or full orchestras, the tape recording can become an inspiring and realistic means of evaluation, instruction, and improvement. Individual and group performance—vocal, choral, and instrumental—can be judged, discussed, and ultimately improved by means of recordings. The tape recorder is of value in teaching, regardless of grade level or subject area. The extent of its use depends on the teacher's understanding of the basic characteristics of the technique and his insight into the never-ending opportunities thus made possible.

Prerecorded tapes, although exceedingly valuable in modern languages, are also extremely valuable in music appreciation and in self-evaluation in choral, orchestral, and instrumental learning situations. They are available in both stereo and high-fi.

In selecting tape recording equipment, the teacher should consider the ease of operation and maintenance and above all the ease and speed with which the recorder can be repaired when something goes wrong. The carefully selected, effectively maintained, and wisely used tape recorder can become a valuable part of the classroom equipment.

Suggested Activities

1. As a practice teacher or a teacher in service, plan for the actual use of the tape recorder in enriching learning opportunities in your subject area. Include a statement of objectives and a description of the recording activity you will use. Also describe the physical and mechanical arrangements for using the tape recorder.
2. Set up a tape recorder in any normal classroom situation. Later, in private, listen to the playback and ask yourself such questions as these: Is my speech pleasant? Is my enunciation clear and understandable? Is my manner toward children pleasing? Can I learn anything from the children's responses to my questions and leadership?
3. As a teacher, anticipate the problems in language arts, music, or general learning that will arise next week, and make plans for handling them; use the tape recorder.
4. List the ways in which you feel that the use of a tape recorder may be important to your colleagues who are not now using one.
5. Consult the Source Lists on pages 477 ff. and write for materials in which you are interested.

Bibliography

How to Make Good Tape Recordings, Audio Devices, 444 Madison Avenue, New York 22, 1956.

Leslie, Louis A., *Tape Recording in Business Education,* Minnesota Mining and Manufacturing Corp., St. Paul, 1956.

Mark, David, *How to Select and Use Your Tape Recorder,* John F. Rider, New York, 1956.

Teachers Make: Slides, Opaques, Tape Recordings, C. C. Dunavan, Emma Fantone, AV Handbook, State Department of Education, New Jersey, 1961.

Terry, Ruth, *Tape Recordings in the English Classroom,* Michigan Audio-Visual Association, 834 Ruddiman Drive, North Muskegon, Mich., 1956.

The Tape Recorder in the Classroom, Visual Instruction Bureau, University of Texas, 1959.

Using the Tape Recorder, Board of Education, New York City, 1953.

CHAPTER 12

STILL PROJECTION

THE STARTING BELL INTERRUPTED a group of students who were animatedly discussing an espionage film they had seen the night before at a downtown theater.

"I still say it was the bunk. There's no such thing as a magic-ray camera that can pick up a license number from 10,000 feet!"

"Who says so? For all we know, the Air Force has better cameras than that right now."

"My brother has a telescopic lens on his camera that can pick out a girl on the beach half a mile away. I've seen him do it!"

Noting the end of the conversation with some amusement, the

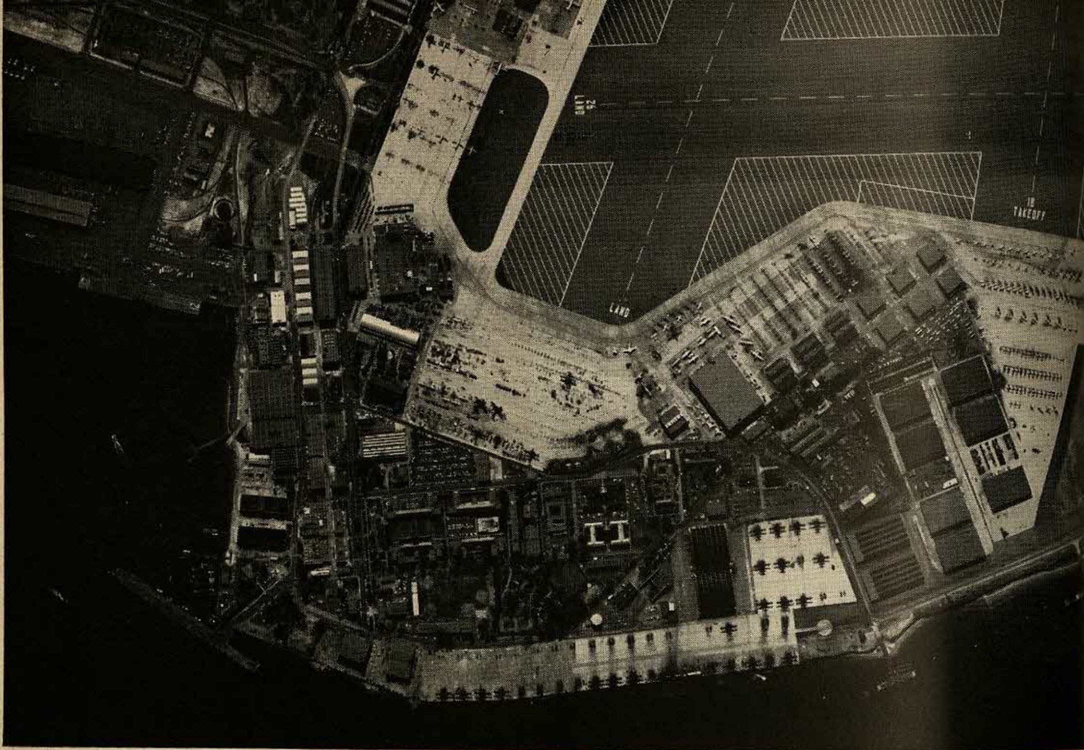

Fig. 12.1. This shot of the San Diego Naval Base was taken from over 70,000 feet. Note the clarity with which the 6-inch lines on the airfield can be seen. Former President Eisenhower used this picture in a TV report to the nation.

physics instructor decided to try to develop this interest in cameras into something worthwhile. A few questions revealed a general curiosity about cameras, particularly those used in photographing the earth from high altitudes.

The next morning after the class assembled, the lights were turned off and the instructor flashed a picture on the screen with the comment, "I thought you might be interested in seeing what some of our advanced aerial cameras can do. This is a picture taken from more than 13 miles above San Diego. I found it in a magazine last evening." (Fig. 12.1.)

The discussion that followed resulted in planned investigation, reading, and reports on the subject of high-altitude photography. A few days later one committee used a filmstrip showing photographs from satellites and of missile launchings as examples of photographic progress to date (Fig. 12.2). . . .

As the children settled into their chairs, Miss Miller started discussing a subject they had been talking about for several days in their reading class.

"Now, children, what did we see with Peter and Susan yesterday on their grandfather's farm?"

"We saw their grandfather," said Fred. "A cow," said Mary. "A sheep and some pigs," said a third youngster. "There were little pigs and big pigs," volunteered another. Eager responses came tumbling out from most of the boys and girls.

"Now, what were we about to see with Peter and Susan when our reading period ended yesterday?" Again there was a flurry of hands. Miss Miller called on Joanne, a shy little girl with big eyes.

"We were going to see the barn," said Joanne.

"Yes, Joanne. I wonder what the barn will look like. Who has seen a barn and can tell us what it looks like? What is inside?"

Miss Miller went to the chalkboard and wrote the words BARN, RED, BIG, HAY, COWS, HORSE, and a few others as they came up in the children's discussion.

"Now shall we see if we can find all these things with Susan and Peter when they go to their grandfather's barn? Fine. And maybe we'll find some other things too. We'll look very closely, won't we?

"Very well. Who would like to close the shades? Jack and Joanne. And you may switch off the lights, John."

Thus the stage is set by one primary teacher for an exciting adventure which will give pleasure to her pupils and explain several new concepts to them. Later in the spring she will take them to visit a real farm. Meantime, however, she

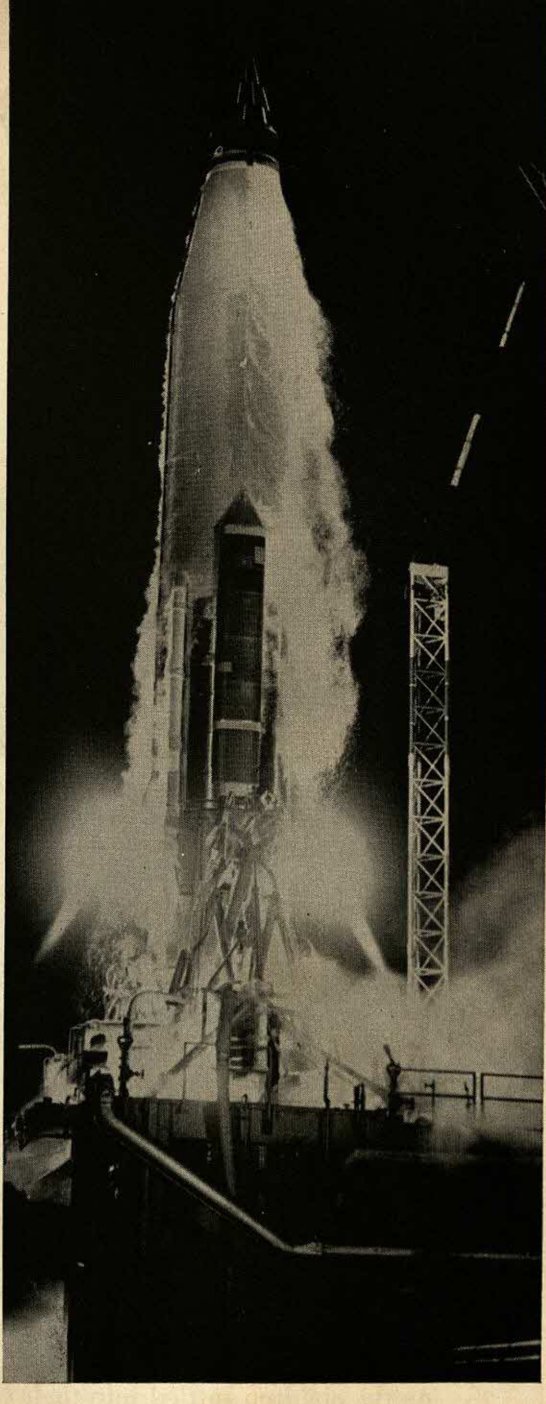

Fig. 12.2. An Atlas missile launching at Cape Canaveral.

makes good use of a color filmstrip that is correlated with one of their books in natural science.

Next week a motion picture is scheduled which will give additional new meaning to life on a farm in the spring. At the moment, however, this teacher wants to present the meaning of new terms at the children's own rate; hence she uses a filmstrip so that each picture may be discussed as long as necessary. What other advantages might a filmstrip have in comparable teaching situations?

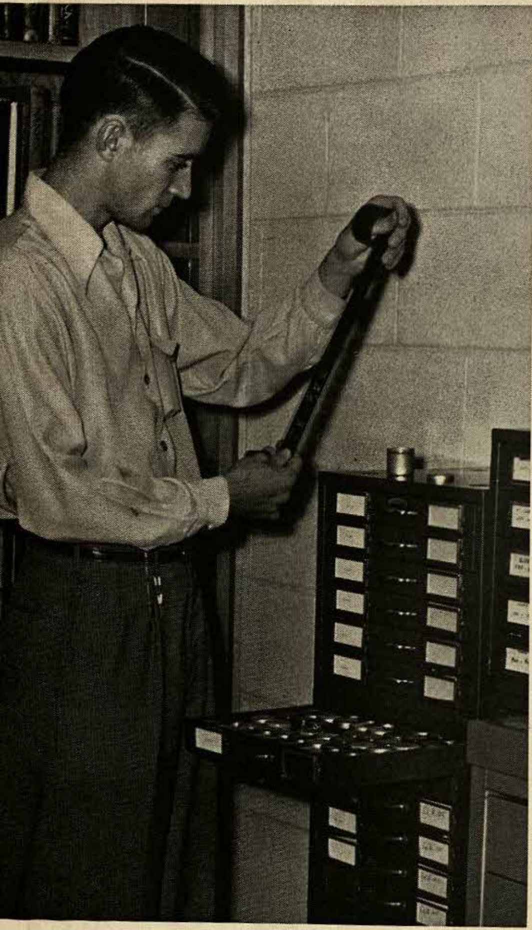

Fig. 12.3. The convenience of filmstrips is suggested here. On this small strip of film is a complete unit of pictorial information plus explanatory captions. Note also the small container and the handy storage cases.

Suggested above are two typical learning situations involving still projection—the first with an opaque projector and the second with a filmstrip. Other familiar and useful means of still projection are 2″ x 2″ and 3¼″ x 4″ slides. Not so well known but rapidly gaining favor among instructors who have worked with it is the overhead transparency projector. There are several, more specialized types of still projection including microscope slide projection, microfilm readers, and stereodisk viewers.

As was true of the other types of audiovisual materials already discussed, each member of the still projection family has certain unique values in teaching and learning. In this chapter we shall identify these values and how the several types can be used to best advantage.

FILMSTRIPS

A filmstrip is a related sequence of transparent still pictures or images on a strip of 35mm. film (Fig. 12.3). The pictures may be in color or in black and white. A large proportion of all filmstrips consist of single-frame pictures about ¾″ x 1″ in size. In single-frame filmstrips the frames are one above another. The pictures in double-frame filmstrips are approximately twice as large and these frames are side by side on the film. Both types of filmstrip are shown in Fig. 12.4. Whereas single-frame filmstrips require special camera equipment, you can make your own double-frame filmstrips with a regular 35mm. camera. The projector usually can be adjusted for either size, although some projectors accommodate only single-frame filmstrips.

PHYSICAL CHARACTERISTICS

A filmstrip typically contains from 20 to 50 frames, although it may have more. A complete filmstrip is usually several feet in length, and is easily rolled up to fit into a small metal container. As we saw in Fig. 12.3, filmstrip containers take up little space and can be stored readily. The cost—$3 to $6.50 for most filmstrips—is low enough so that it is practical to keep sets of filmstrips in each classroom for use when needed.

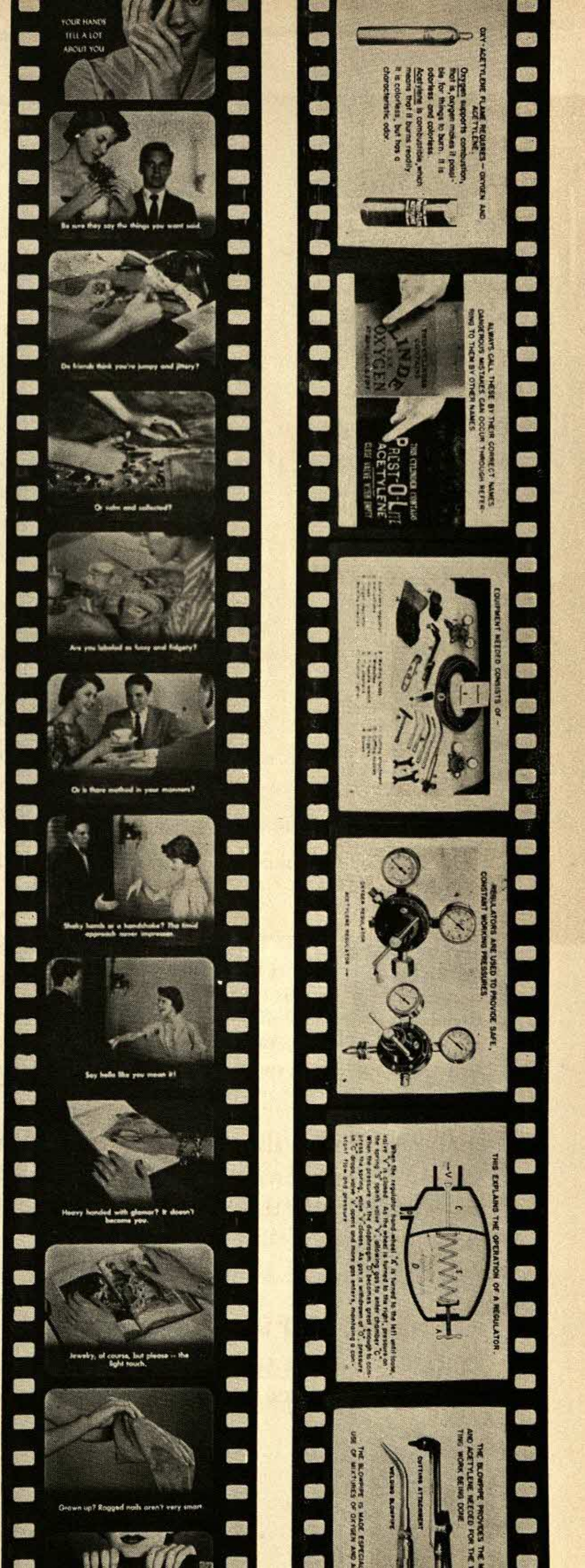
YOUR HANDS TELL A LOT ABOUT YOU
Be sure they say the things you want said.
Do friends think you're jumpy and jittery?
Or calm and collected?
Are you labeled as fussy and fidgety?
Or is there method in your manners?
Shaky hands or a handshake? The timid approach never impresses.
Say hello like you mean it!
Heavy handed with glamor? It doesn't become you.
Jewelry, of course, but please -- the light touch.
Grown up? Ragged nails aren't very smart
OXY-ACETYLENE FLAME REQUIRES — OXYGEN AND ACETYLENE.
OXYGEN
LINDE OXYGEN
PREST-O-LITE ACETYLENE
EQUIPMENT NEEDED CONSISTS OF -
REGULATORS ARE USED TO PROVIDE SAFE, CONSTANT WORKING PRESSURES.
THIS EXPLAINS THE OPERATION OF A REGULATOR.

Fig. 12.4. This picture illustrates two differences between single-frame and double-frame filmstrips. How do they differ in projection requirements?

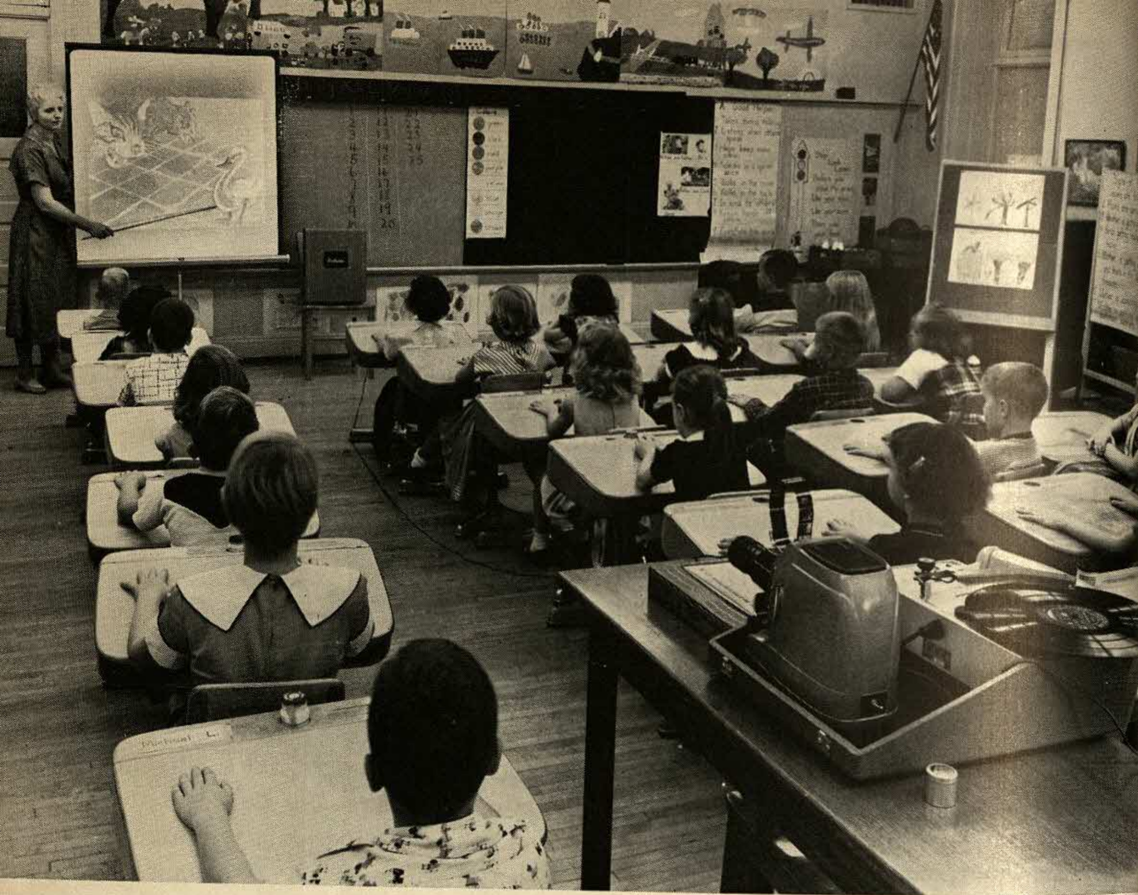

Fig. 12.5. In what situations in your own field could the sound filmstrip be used to advantage?

Some filmstrips are accompanied by records. These filmstrips are called *sound filmstrips*. The record usually carries narration and may also include appropriate music and sound effects. Combination record players and filmstrip projectors such as the one shown in Fig. 12.5 are convenient and compact. However, a record player and projector that are separate can be used without difficulty.

Sound filmstrips are valuable in providing standardized instruction. Such instruction is necessary for certain technical and industrial processes such as assembling a carburetor or teaching recommended sales techniques. The sound filmstrip has accordingly been extensively used in industrial and military training programs where uniformity is of primary importance.

For school use, sound filmstrips are frequently valuable when the record is turned off and the teacher or a student provides the "sound." This procedure preserves one of the principal advantages of the filmstrip, namely, its adaptability for use at the desired pace. Thus the sound filmstrip becomes essentially a silent filmstrip, except that there are few explanatory captions, because most sound filmstrips contain no subtitles.

Sound filmstrips are likewise useful in such school activities as music, reading readiness, industrial arts, and guidance. Although the pace of a sound filmstrip is fixed by the record, the combination is effective and convenient for some teaching purposes. What are some learning situations where a standardized presentation of this type would be desirable?

Relatively few sound filmstrips are available for school use in comparison with the great number of silent filmstrips produced each year. This large output is the result of a demand which has increased rapidly for several reasons. Filmstrips are easy to use. Filmstrip projectors are inexpensive, simple to operate, and seldom give trouble. Good pictures can be projected on the screen in spite of limited facilities for darkening the room; this is particularly true of black-and-white filmstrips.

These advantageous physical characteristics cannot by themselves account for the wide popularity of filmstrips, particularly among elementary teachers. Filmstrips also have distinctive teaching characteristics.

INSTRUCTIONAL CHARACTERISTICS

The first advantage of a filmstrip from a teacher's standpoint is that it can be used at any speed desired. For introductory or review purposes the teacher can run through it rather quickly. Or he can use only a few frames during a class period, holding each one on the screen as long as necessary to permit detailed discussion. (This, of course, can be done with other types of still projection, but not all of them combine this with the physical characteristics described above.)

A second instructional value is the sequential order of the frames. Subjects are treated in logical order, step by step, and the pictures cannot get out of order. The specific purpose for which the filmstrip was produced determines the order of the frames, the amount of detail on each, and the nature of the treatment. If that purpose corresponds with the teacher's, as it should if he is using the filmstrip, he has a ready-made, efficient, and convenient teaching tool.

For example, *Peter and Susan Visit Grandfather's Farm*[1] is designed to provide background experience for a primary reading class. Hence the scenes are set up in a sequence which provides an ordered series of new word concepts about a farm. At the same time the filmstrip tells an interesting story so that the pupils are led naturally from one part of the farm to another and from one set of new word concepts to another.

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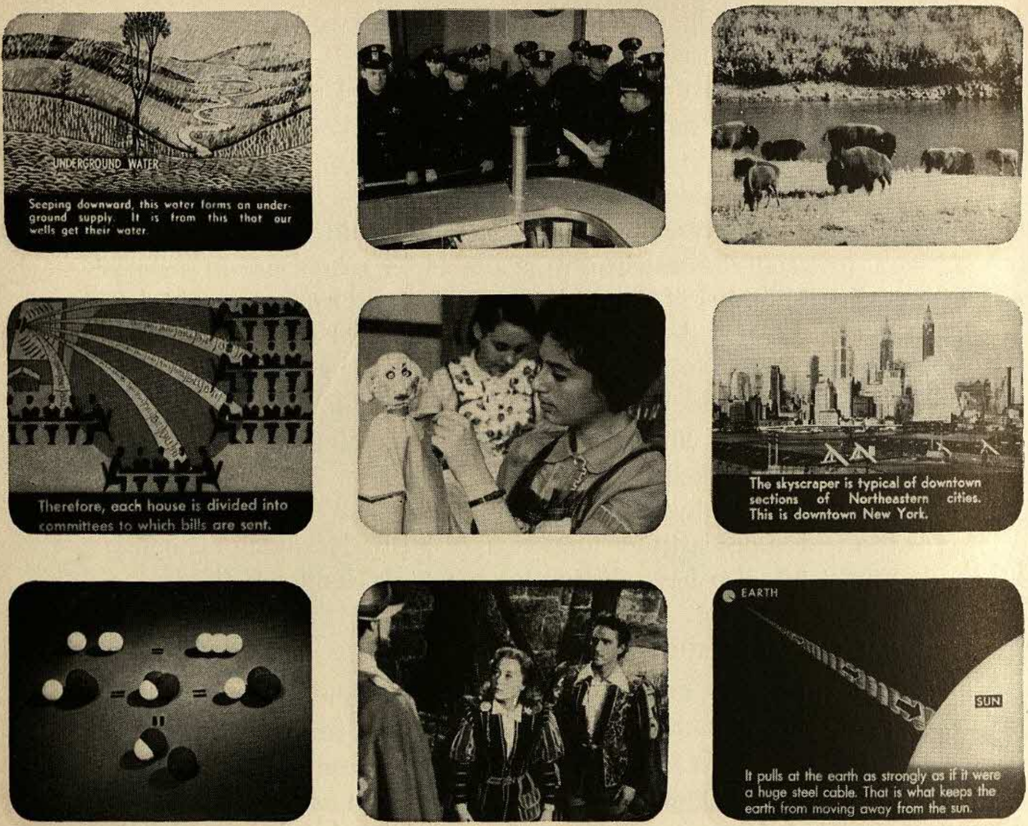
[1] Society for Visual Education.



Seeping downward, this water forms an underground supply. It is from this that our wells get their water.

Therefore, each house is divided into committees to which bills are sent.

The skyscraper is typical of downtown sections of Northeastern cities. This is downtown New York.

It pulls at the earth as strongly as if it were a huge steel cable. That is what keeps the earth from moving away from the sun.

Fig. 12.6. Selected frames from 18 filmstrips, made by various producers, that indicate something of the variety and number of filmstrips available. Aside from flat pictures, no other form of visual material is so readily available to the teacher.

Another filmstrip, *The Micrometer,*[2] is designed to show the correct method of using and reading this measuring instrument. It moves carefully from the first to the final step in reading a micrometer. The last frames review the sailient points.

In both these cases there is an ordered sequence of scenes and titles that is fixed according to the instructional purpose for which the filmstrip is designed. What are some other advantages of this fixed order of scenes in a filmstrip? Are there also some disadvantages?

A third favorable instructional characteristic of filmstrips is the range and number of titles. As was said earlier, a heavy demand and relatively low costs have encouraged producers to turn out great numbers of new filmstrips each year on every conceivable subject. This range of subject goes well be-

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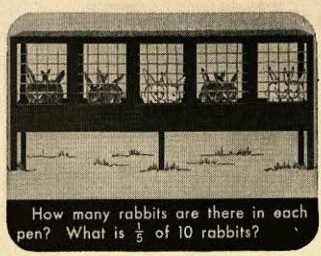
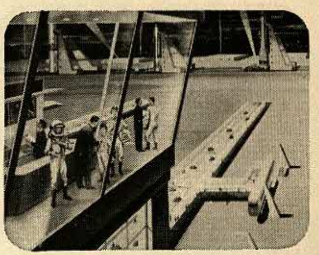
[2] United World, Government Films Division.

Burmese women teach their daughters how to make thatch for the roof.


How many rabbits are there in each pen? What is $\frac{1}{5}$ of 10 rabbits?

15. The older people of Moscow have seen many changes in the city.

Left arm out—turn left.



Man made satellites explore the outer layers and the space beyond the air.

yond the elementary-school curriculum into many areas at secondary, college, and adult levels.

A few examples of this variety in filmstrip subjects is shown in Fig. 12.6, which presents selected single frames from 18 different filmstrips. This selection would need to be multiplied at least 200 times to get an idea of the number of new filmstrips produced in the United States each year.

Other distinctive and significant subjects available in filmstrip form include *Life's* pictorial features on the history of man and of the world. There are also the *New York Times Current Affairs* filmstrips which are published monthly. In addition, several filmstrip services send out releases on new current events and science filmstrips at regular intervals during the school year. Sources of these and other filmstrips are listed on pages 482 ff.

An interesting development in this connection is the extent to which publishers of textbooks are producing filmstrips closely correlated with text materials. A similar tendency is evidenced in the production of 16mm.

teaching films correlated with textbooks. Both represent a healthy trend toward the combined use of several kinds of instructional materials based on the particular contributions to learning offered by each one.

LIMITATIONS OF FILMSTRIPS

Like any other teaching material, the filmstrip has limitations as well as advantages.

1. Filmstrips are a "still" medium. They do not portray motion effectively and are not intended to do so. If motion is important for comprehension, a motion picture should be used. Once the motion aspect is understood, however, the filmstrip is excellent for detailed study and review. For this reason films and filmstrips make a good instructional "team."

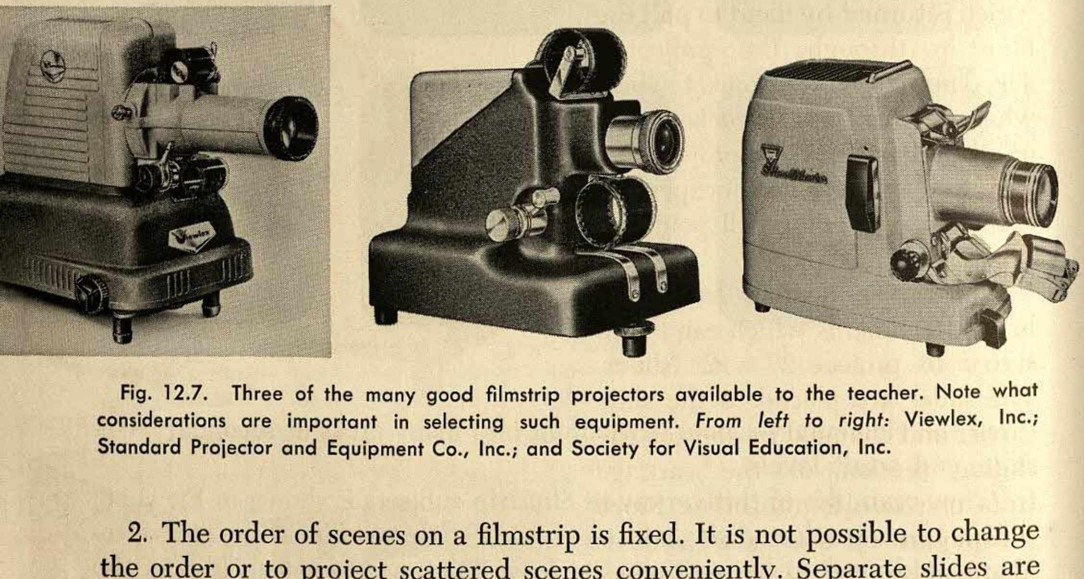


Fig. 12.7. Three of the many good filmstrip projectors available to the teacher. Note what considerations are important in selecting such equipment. *From left to right:* Viewlex, Inc.; Standard Projector and Equipment Co., Inc.; and Society for Visual Education, Inc.

2. The order of scenes on a filmstrip is fixed. It is not possible to change the order or to project scattered scenes conveniently. Separate slides are preferable in the latter case, since slides can be shown in any order desired.

3. Filmstrips are rather easily damaged and difficult to repair. The base of a filmstrip is cellulose acetate, a substance which is resistant to ordinary wear and tear and is also noninflammable. The sprocket holes will break easily, however, if the projector is not properly threaded or is out of adjustment. Unfortunately there is no practical way of repairing damaged sections. Since damage of this kind ordinarily occurs on the leader strip while the projector is being threaded, it can usually be detected before the picture section itself is damaged. Rubberized pressure rollers or other substitutes for sprockets may sometime provide a solution to the problem of

sprocket-hole damage. Meantime, reasonable care in using the projector will hold such damage to a minimum.

FILMSTRIP AND 2″ x 2″ SLIDE PROJECTORS

A filmstrip projector (Fig. 12.7) is essentially a simple mechanism. It consists primarily of a lamp, a reflector, a series of lenses, and a smooth channel for the film. Near the base of this channel is a knob which is turned by hand to pull the filmstrip through the projector. The knob turns a sprocket wheel whose teeth fit into sprocket holes on the filmstrip. The projector is easy to operate and is inexpensive and light in weight—all points of practical importance.

Filmstrip projectors frequently have attachments which can be inserted to project 2″ x 2″ slides. The slides are placed in the slide carrier and changed by shifting the sliding section of the carriage from one side to the other. Since the picture on a 2″ x 2″ slide is identical in size with a double-frame picture on a filmstrip, the same lens and light system is suitable for both filmstrips and 2″ x 2″ slides. Multipurpose projectors are available which accommodate both single-frame and double-frame filmstrips as well as 2″ x 2″ slides; the aperture is adjusted for the two sizes.

Some projectors are made only

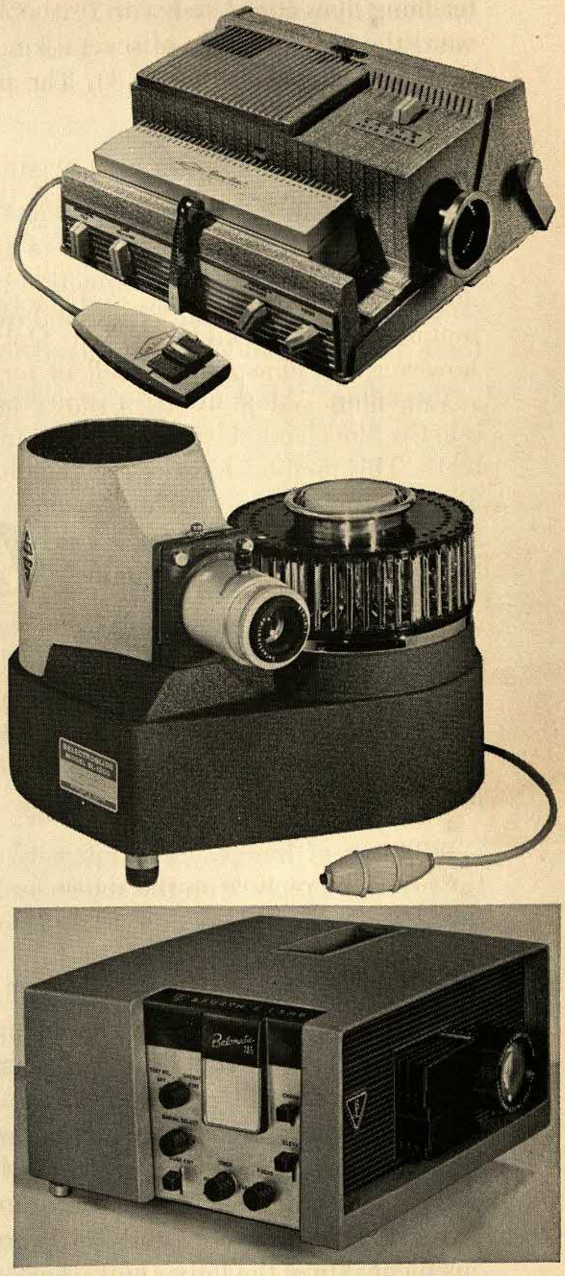


Fig. 12.8. Three cartridge-type 2″ x 2″ slide projectors—again representative of the many available. Most filmstrip projectors are adaptable for 2″ x 2″ slides. Top to bottom: Sawyer's, Inc.; Spindler and Sauppe, Inc.; Bausch and Lomb Optical Co.

for filmstrips, others only for 2″ x 2″ slides. Among the latter are various models with cartridges into which a complete selection of slides can be loaded in advance (Fig. 12.8). The projector is operated either manually or by remote control.

SELECTION OF FILMSTRIP AND 2″ X 2″ SLIDE PROJECTORS

Filmstrip and 2″ x 2″ slide projectors vary somewhat from one make to another as to threading, ease of interchanging the slide carriage and filmstrip mechanism (in combination-type projectors), brilliance of the projected image, projection lenses, and quality of the cooling system. Each of these factors should be considered in selecting a projector.

Threading. Most filmstrip projectors are threaded by inserting the film into the film channel from above and pushing it down to engage the sprocket teeth. This method has the advantage of insuring correct alignment in the film channel and proper engagement with the sprocket teeth. Since the sprocket holes on filmstrips are easily broken, ease of threading the projector is an important consideration.

Interchanging. A related factor on combination filmstrip and 2″ x 2″ slide projectors is the ease with which the slide carriage and filmstrip fittings can be interchanged. Good engineering design can make this a simple process. Similarly on projectors built to accommodate both single- and double-frame filmstrips, it should be possible to make the necessary change in apertures easily.

Brilliance of Image. The intensity of light determines the brilliance of the projected picture on the screen and hence the degree of darkness necessary for effective projection. Light intensity is determined primarily by the power of the projection lamp and the quality of the lens system. Although projectors with lower power are still found in use occasionally, nothing less than a 500-watt capacity should be considered in a projector for general school use. This amount of power is necessary to project a picture that is of sufficient size, brilliance, and color.

With larger groups, as when several classes are combined, a 750- or 1000-watt projector is needed for best results. For very large groups, as in a large auditorium, a 1000- or 1200-watt lamp is the minimum. In this case, professional-type arc-lighted equipment may be required.

The quality of the lenses and reflectors is almost as important as the power of the projection lamp in obtaining a brilliant image on the screen. Manufacturers agree that brilliance over the entire picture area is important for effective projection of filmstrips and slides. Accordingly, the most satisfactory way to compare several projectors is to line them up side by side and project the same color picture simultaneously on each projector under conditions of normal use. By aligning the screen images from several projector positions first side by side and then overlapping them slightly, a good comparison of their relative quality can be made.

Projection Lenses. The focal length of the lens, the size of the aperture, and the distance from projector to screen determine the size of picture seen. It is normally desirable to project from the rear of the classroom to avoid distracting pupils or blocking the view of those who are seated behind the projector. For these reasons, the length and size of the projection should be considered when purchasing a projector.

Most filmstrip projectors are equipped with a 5″ projection lens which produces a single-frame image 42″ x 55″ from a distance of 25 feet, and an image 48″ x 65″ from 30 feet. Although the 5″ lens is suitable for most classrooms, a 7″ lens is preferable for larger classrooms and assembly rooms. With this lens a projector 50 feet from the screen provides a picture 58″ x 77″.[3] At this distance the picture projected by a 5″ lens would be too large for the average portable screen. Hence if the same projector is to be used in both large and small rooms, it is desirable to have more than one lens. Another advantage of the 7″ lens is that it projects a 2″ x 2″ slide picture that is approximately the same size as a 16mm. motion picture projected from the same distance with a standard 2″ lens. If a teacher wishes to use both slides and motion pictures in a lesson, the two projectors can be placed side by side.

Cooling Systems. Since one of the significant instructional advantages of the filmstrip is the fact that pictures can be shown on the screen as long as desired, an efficient cooling system is essential to carry off some of the intense heat generated by the lamp. Prolonged exposure to excessive heat causes a filmstrip or slide to blister. Once damaged in this way, it is no longer satisfactory for use. The alternative is to avoid leaving a picture on the screen for more than a minute or two, but this may not be long enough for the teaching need.

Filmstrip and slide projectors should be equipped with an electric fan for cooling. The fan forces a steady flow of air through the lamp house to provide needed cooling efficiency.

Another factor is the quietness with which the cooling fan operates. Some noise is inevitable, but good engineering on most projectors has reduced the noise factor to a minimum.

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[3] The figures given are for the usual single-frame filmstrip. Double-frame filmstrips and 2″ x 2″ slides provide pictures which are 4.5′ x 6.5′ at 25 feet, 5.4′ x 7.8′ at 30 feet, and 9.0′ x 13.0′ at 50 feet.

USING FILMSTRIPS AND SLIDES EFFECTIVELY

The value of filmstrips and slides in teaching numerous subjects at levels ranging from primary grades to the college and adult level has been studied both here and abroad for many years.[4] Such subjects as economics, history, social studies, spelling, health, map reading, elementary mechanics, nursing, and armed forces training were included. In general, these conclusions are apparently supported by the research evidence.

1. Filmstrips and slides are effective means of communicating factual information and certain skills. However, a combination of these media with sound films or other materials is usually superior to any one medium alone.
2. The extent to which filmstrips or slides embody *unique* pictorial content of good quality has a direct bearing on their effectiveness in teaching.

As is true of other teaching materials, however, filmstrips and slides must be *used* effectively if they are to provide the maximum benefits.

SELECTION

The first step in efficient use involves deciding whether the filmstrip can serve the teaching purpose better than another available device. This must be decided in terms of what the filmstrip can and cannot do, i.e., its inherent characteristics. These will be reviewed in the form of several questions which the instructor might well ask himself.

1. *Is the purpose for which I wish to use this filmstrip one in which motion is essential for pupil understanding?* If so, the filmstrip is not the best medium because it is a still-picture medium. On the other hand, if the motion aspects of a subject such as a gasoline engine can be presented by a film or a cutaway model, and the immediate purpose is to obtain a more detailed understanding of the operating parts of the engine, the filmstrip may serve the purpose very well.

2. *Does the purpose involve a series of step-by-step developments, one leading to the next in logical sequence?* If so, the filmstrip is well suited, because it is usually designed to tell its story in a series of related steps. But if sequence is not important, slides may prove more useful.

3. *Are suitable filmstrips available for the particular teaching job I have in mind?* This is a question of practical import to most teachers because keeping track of the large number of new filmstrips in any given field is a considerable task. Professional journals frequently contain sections that re-

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[4] An excellent summary of the research done on the effectiveness of filmstrips and slides will be found in William H. Allen's article on audiovisual materials in the 1960 edition of Monroe's *Encyclopaedia of Educational Research,* Macmillan, pp. 120–121.

view new films and filmstrips. In addition, several publications provide periodic evaluations of such materials.[5]

The importance of careful selection of filmstrips for effective results is suggested by three studies in the areas of economics, geometry, and the social studies. All three raise the question of the uniqueness and quality of the filmstrips that were used.

In a study comparing the use of four filmstrips with lectures in teaching economic concepts to university students, Stampolis and Sewell[6] found one case in which the filmstrip was significantly superior, and three cases in which there was no difference.

Johnson[7] found that a combination of three motion-picture films and three filmstrips definitely improved retention and ability to apply geometric principles and facts regarding circles. Neither films nor filmstrips alone produced comparable results. The initial learning of facts and problem-solving skills in geometry was not increased by the use of films and filmstrips, but Johnson suggests that this may have been due to the fact that the materials themselves were similar in nature to those commonly found in textbooks or drawn on the blackboard by the teacher.

Vandermeer similarly stresses the fact that the pictures on a filmstrip must contribute something unique if the filmstrip is to be any more effective than words in the learning situation. He compared results, in terms of immediate factual learning and recall of information over a three-week period, from using a particular American history filmstrip with one group and only the reading material from that filmstrip with another group. He found no significant superiority for either group. In assessing his findings Vandermeer came to the conclusion that ". . . when the pictorial element of the filmstrip is deficient in detail, definition, or clarity, it not only fails to contribute to the students' knowledge but may actually serve to inhibit learning."[8]

In a word, to secure effective results, the instructor must first select filmstrips which tell their story primarily through pictures rather than words. Second, the pictures must be of such nature and quality as to contribute something at once significant and unique to the learning situation. These two principles probably apply with equal validity to any type of still picture used in teaching.

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[5] A National Directory of the Newer Media has been undertaken by the Educational Media Council under a Title VII grant from the U.S. Office of Education. This Directory is planned to provide basic information on films, filmstrips, kinescopes, slide sets, transparencies in sets, flat pictures in sets, disk recordings, tapes, and videotapes.

[6] Anthony Stampolis and Laurence S. Sewell, Jr., *A Study of Film Strips Communicating Economic Concepts*, School of Public Relations and Communications, Boston University, Boston, 1952.

[7] Donovan A. Johnson, "Are Films and Filmstrips Effective in Teaching Geometry?" *School Science and Mathematics*, October, 1950, pp. 570–574.

[8] A. W. Vandermeer, "Relative Contributions to Factual Learning of the Pictorial and Verbal Elements of a Filmstrip," *School Review*, February, 1950, pp. 84–89.

PREVIEW

A second step in using filmstrips effectively is for the instructor to preview carefully those selected, for the purpose of preparing himself. He must know rather precisely what the filmstrip contains in planning how to use it with his pupils, what points to emphasize, and what points require additional clarification. A convenient means of examining content is to use a filmstrip viewer (Fig. 12.9).

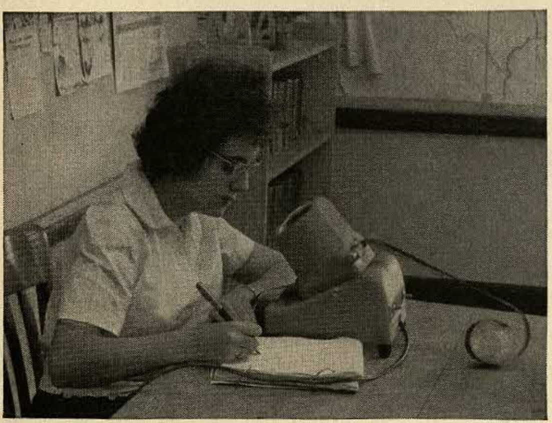

Fig. 12.9. Evaluating a filmstrip means assessing its quality in terms of general curriculum requirements. Selecting one for a particular lesson is a much more specific task requiring examination of the individual frames.

The preview likewise enables him to decide when to use the filmstrip to the best advantage. Is it stimulating enough for the introduction? Does it fit well into the body of the lesson? Is it best suited to the summary and review? Or can it be used to advantage at several points and for more than one purpose?

CLASS PREPARATION

Having determined, after previewing the filmstrip, how he will use it in the lesson, the instructor must prepare the class to see it. There are several ways in which he can accomplish this.

1. *He may explain why the pupils are shown this filmstrip at this particular time.* This may call for only a brief statement or it may require extended discussion. The point involves pupil readiness. It depends somewhat on the interest already present and on previously acquired information about the topic. It is not a separate, distinct step but rather part of the motivation process. The important point is that the students *want* to see it for reasons of their own.

2. *He should indicate clearly what to look for.* How an instructor uses a filmstrip or any other kind of teaching material naturally depends on *why* he is using it—in other words, his specific objectives. Should his purpose be to provide a general overview and arouse interest, he may indicate general rather than specific points to be looked for. On the other hand, if he wants to clarify certain definite concepts, he will wish his students to be

alert for the answers to specific questions. For example, in using *The Slide Rule—Multiplication and Division,*[9] the mathematics instructor might well ask in advance such questions as the following:

a. What two scales on the slide rule are used for multiplication and division?
b. How should the scales be lined up to multiply? To divide?
c. How and where is the result found?

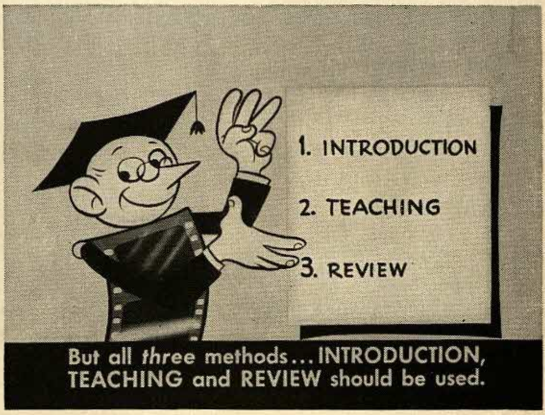
1. INTRODUCTION
2. TEACHING
3. REVIEW
But all *three* methods... INTRODUCTION, TEACHING and REVIEW should be used.

Fig. 12.10. This frame from the filmstrip *Teaching with the Filmstrip* suggests several ways in which filmstrips can be used.

3. *He should anticipate new or difficult words, phrases, and symbols.* Unless the primary purpose of using a filmstrip is to teach new word concepts, as in a reading lesson, it is essential to remove in advance such barriers to learning as new words and symbols. This can be done through discussion, use of the dictionary, and illustrations. The new concepts will then be applied promptly when the filmstrip is shown, and they are likely to be well learned as a result. Of much greater importance, however, is the pupil's improved comprehension of content made possible by the removal of vocabulary barriers.

PRESENTATION

Mechanical as well as instructional considerations are involved in the effective use of filmstrips and slides.

Most teachers quickly sense the convenience, as well as the great effectiveness, of having all their teaching materials ready for use at the beginning of the period. The filmstrip or slide projector can be set up and tested in a few minutes, so that at the proper moment a flick of the switch will bring the first picture to the screen without delay and confusion.

More important is the fact that when everything is in readiness, lesson interruptions are held to a minimum. The filmstrip, slide, or other projected medium fits smoothly and naturally into the learning experience. It assumes its proper role in helping to put across certain ideas without attracting undue attention to the operator or the projector. The instructor is not forced into the uncomfortable position of saying, "And now, class, we are going to see

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[9] U.S. Office of Education; available from United World Films.

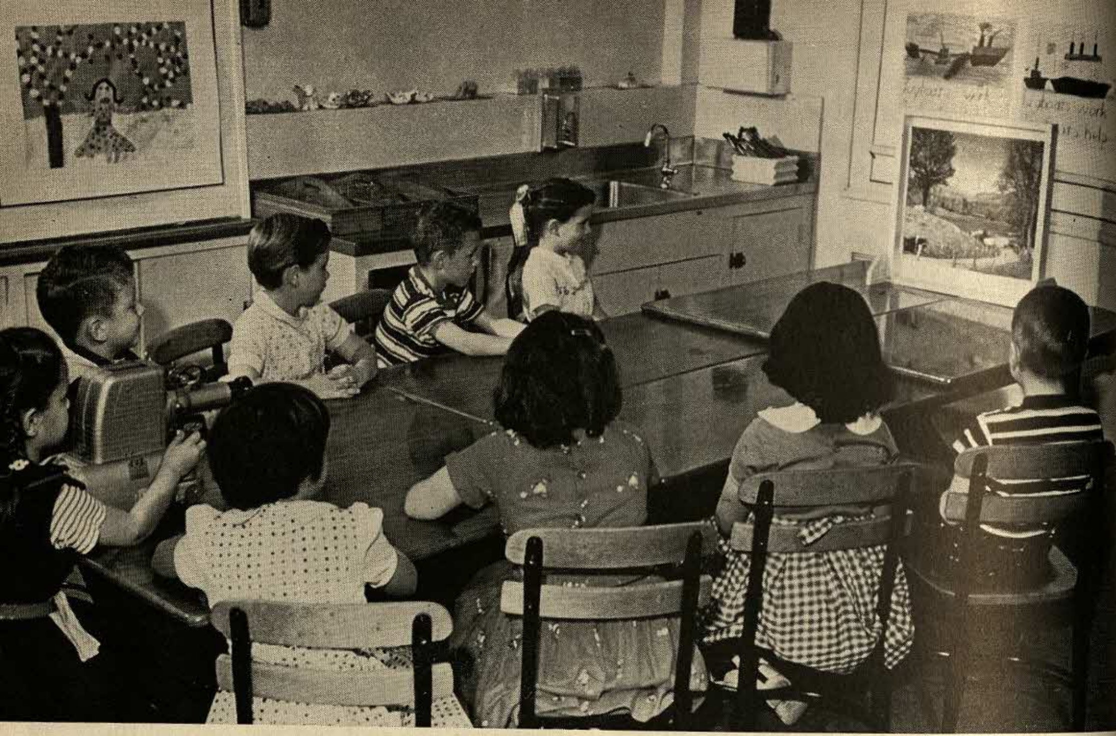


Fig. 12.11. The value of filmstrips for small-group or individual viewing should not be overlooked. This adds to the students' responsibility for their own learning, provides for individual differences to an extent, and adds flexibility to classroom procedures. Note also that in a fully lighted room this 500-watt projector throws a good picture on the screen at short range.

some pictures of the Monarch butterfly"—while adding fervently to himself, "I hope."

The Captions. What should be done about the captions? Does the teacher read them aloud or does he leave them on the screen long enough for the slowest readers to comprehend them? The following discussion between a friendly supervisor and one of his teachers throws some light on this problem:

"Well, John, let's back up a bit. Why are you using this filmstrip at this point? As an introductory overview perhaps? If so, it is quite appropriate to read the titles as you go along. It saves time, keeps things moving, and, most important, it assures everyone's following the story as it unfolds on the screen.

"On the other hand, if you are using the filmstrip as a basis for discussion and the students have already seen it, there may be no point in reading the titles aloud. What you want here is discussion, explanation, and questions. There is no need for hurry. In fact, you may want to devote the rest of the period to just a few scenes. One advantage of the projected still picture, as you know, is that you can leave the pictures on the screen just as long as necessary to accomplish your purpose.

"Then there is also the possibility that you are using the filmstrip for a quick review, to 'clinch' ideas which have been developed. It might be a good idea to read the titles again. You are the best judge of that. But if so, why not let some of your students do the reading? You can tell something about how well they understand by how they read the captions. . . . And besides, unless you're quite different from most of us, you've probably talked too much in your class today anyway.

"A further thought, of course, is that a group of students may be using the filmstrip by themselves (Fig. 12.11). Some of the best uses of filmstrips are of that nature. In this case, of course, the students can help one another read the captions if necessary."

THE FOLLOW-UP

Evaluation. After the filmstrip has been used, the instructor may wish to evaluate the results. If so, a brief written or oral test can be given or, better still, he can call for a practical application. Suppose, for example, that the filmstrip dealt with how to read a micrometer. The real test not only of the filmstrip but of the total job of teaching is how well each pupil can read a micrometer.

Evaluation becomes more complicated when the purposes of the lesson go beyond skills and factual information to desirable habits, attitudes, and ideals. The follow-up discussion will provide the teacher with opportunities to observe reactions and new points of view, and to answer questions which suggest further activities. Such observations enable the sensitive instructor to assess subjectively whether progress is being made in desired directions.

Application. Aside from evaluation, the follow-up serves the essential functions of applying newly acquired knowledge and interests and relating them to former experiences. The learner normally proceeds from observation to abstraction, generalization, and assimilation. Seeing a filmstrip is only a small part of this process. A variety of further activities should develop from the new interests. Some children will need further study, others will need little encouragement to explore on their own, and all should have an opportunity to make comparisons with similar experiences they have had.

Assimilation. Out of such comparisons, when there are enough of them, conclusions may come. Conclusions based on related experiences lead gradually to generalizations. After seeing a filmstrip about a farm, the youngsters know that there are cows, horses, chickens, and pigs on that farm. After seeing other filmstrips, films, and pictures and after visiting a farm, they should begin to realize that these animals are typical of many farms. This is a generalization. Later experience will refine this generalization as the students learn to identify different breeds and types of animals according to kinds of farms and regions of the country.

Similarly the concept "horse" develops from one particular animal in one particular picture through a whole series of related learning experiences until the pupil realizes that horses may be of many sizes, shapes, and colors and still be horses. From then on, this generalization, simple though it is, provides the foundation on which all his further learning about horses will be built. Educationally we say that he has *assimilated* this knowledge.

SLIDES AND TRANSPARENCIES

We have gone into considerable detail in discussing the nature and use of filmstrips. Much of what has been said applies equally to other forms of still projection, particularly to slides and overhead transparencies. The differences between these three media are largely physical—that is, materials and, to some extent, the projectors used. So far as the image on the screen is concerned, there is little difference between them. Accordingly, most considerations of selection and use are essentially the same for all three.

On the other hand, the physical differences are of considerable importance to the teacher. Some teachers rarely use filmstrips but make extensive use of slides and transparencies because they find them more convenient and more flexible for their particular purposes.

As many or as few slides or transparencies can be used as is desired, and they can be used in any order. This is somewhat difficult with filmstrips because of their fixed sequence. Hence teachers occasionally cut up a filmstrip and mount some of the individual frames as slides in order to achieve more flexibility. Furthermore, the teacher can make his own slides and transparencies much more easily than he can make a filmstrip.

Although the end results on the screen may be similar, each of the still projection media has certain unique characteristics which the teacher needs to be aware of in order that his teaching may benefit from them. We shall first establish what is meant by slides and transparencies; then see what characteristics they have in common with filmstrips; and finally determine the unique advantages of each and how each can be used to the best advantage.

SLIDES AND TRANSPARENCIES DEFINED

A slide is a single image or picture on film or some other surface through which light can pass and which is mounted for use in a slide projector.

Slides come in several sizes but the most common sizes for teaching purposes are the 2″ x 2″ and the 3¼″ x 4″. There are several types of mounting for slides, the most familiar being the 2″ x 2″ cardboard frame used for mounting 35mm. color film. Better for protection and projection, however, is a glass mounting, in which the picture and its mask are held between two thin pieces of glass; 3¼″ x 4″ slides are usually mounted in this way.

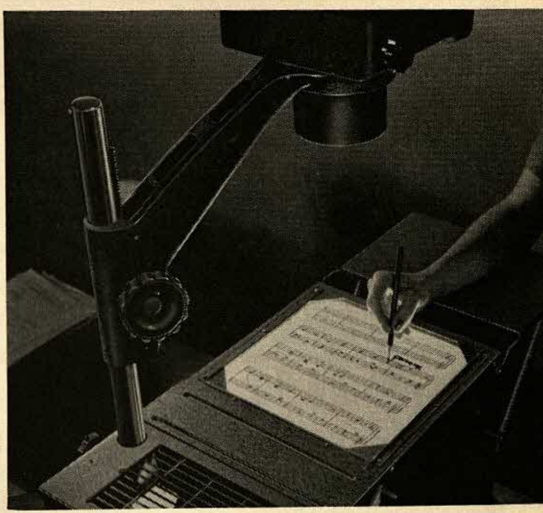


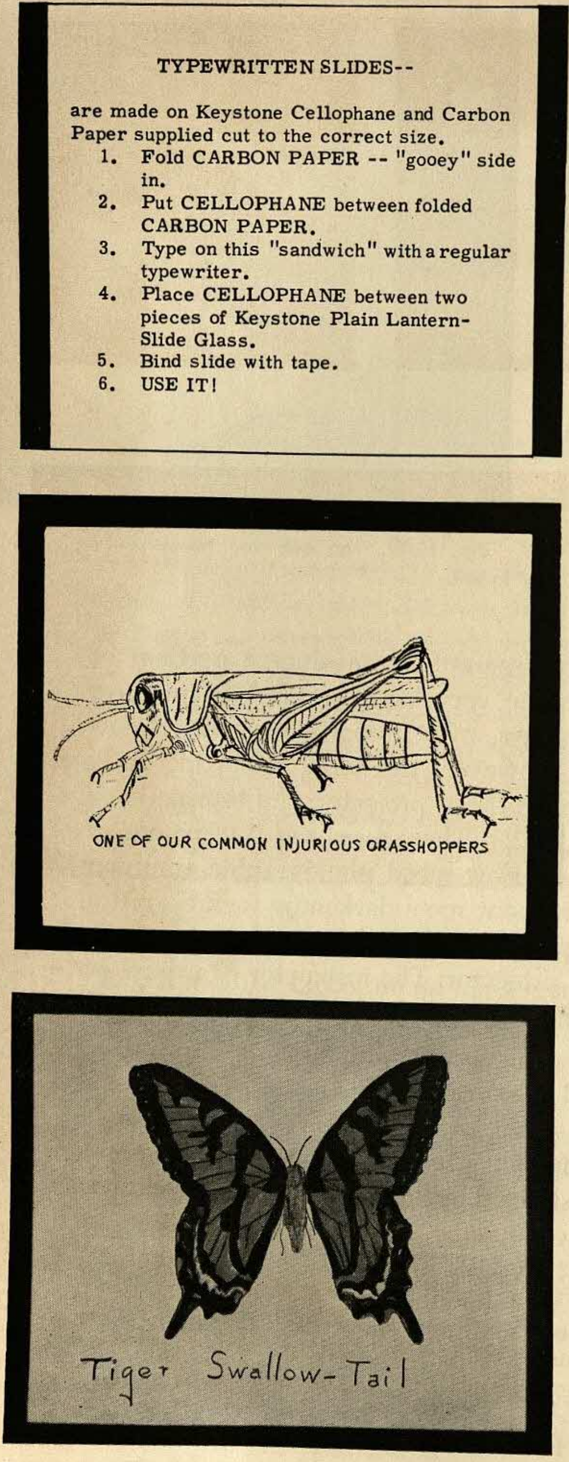
Fig. 12.12. An overhead transparency in use.

A transparency is really a very large slide, usually 7″ x 7″ or 10″ x 10″ in size. The term "transparency" applies broadly to any single image that is seen by means of light passing through it. Thus the transparent or translucent portions of 2″ x 2″ and other slides, as well as the very large backlighted pictures used in exhibits and advertising displays, may properly be called transparencies. As used in this chapter, however, the term refers primarily to transparencies that are used on an overhead projector; the transparency lies flat on the projector stage (Fig. 12.12). These overhead transparencies consist of a clear plastic coated with a slow-speed photographic emulsion that can be exposed and developed without room-darkening facilities. Also available is a 100-foot strip of clear plastic which passes over the projector stage between two rollers inside the projector. The instructor can draw or write on this plastic with a grease pencil; such marks are easily removed with cleansing tissue.

CHARACTERISTICS

Slides, transparencies, and filmstrips are generally similar, with the one major exception that filmstrips have a fixed order. Characteristics common to all three include the following:

1. Slides, transparencies, and filmstrips are still picture media; they are of great value in visual teaching when motion is of secondary importance for comprehension.
2. They are inherently suited to the convenient presentation of a great variety of visual materials such as pictures, cartoons, charts, graphs, dia-



TYPEWRITTEN SLIDES--

are made on Keystone Cellophane and Carbon Paper supplied cut to the correct size.

1. Fold CARBON PAPER -- "gooey" side in.
2. Put CELLOPHANE between folded CARBON PAPER.
3. Type on this "sandwich" with a regular typewriter.
4. Place CELLOPHANE between two pieces of Keystone Plain Lantern-Slide Glass.
5. Bind slide with tape.
6. USE IT!

ONE OF OUR COMMON INJURIOUS GRASSHOPPERS
Tiger Swallow-Tail

Fig. 12.13. Three types of 3¼ x 4 inch slides a teacher can make are shown here: one typewritten, the second drawn in ink, the third drawn with transparent color crayons.

grams, maps, and tables. Virtually anything that can be photographed can be put on a slide or transparency.

3. All three have the attention-focusing power of any projected image.
4. They are well suited for both color and black-and-white projection.
5. All can be made by the teacher, though slides and transparencies are much easier to make than filmstrips; all can also be purchased commercially.
6. They are easy to project.
7. All require only moderate room darkening.
8. They are inexpensive.
9. They cover a wide range of subjects and grade levels.

Most of these characteristics were discussed in connection with filmstrips and flat pictures. However, slides and transparencies have certain advantages and limitations of their own which will be discussed separately.

INSTRUCTIONAL ADVANTAGES OF SLIDES AND TRANSPARENCIES

The 3¼″ x 4″ Lantern Slide. The first slides to achieve wide acceptance in teaching were 3¼″ x 4″ glass-mounted slides. Early in this century, almost every school owned some sets and could borrow others

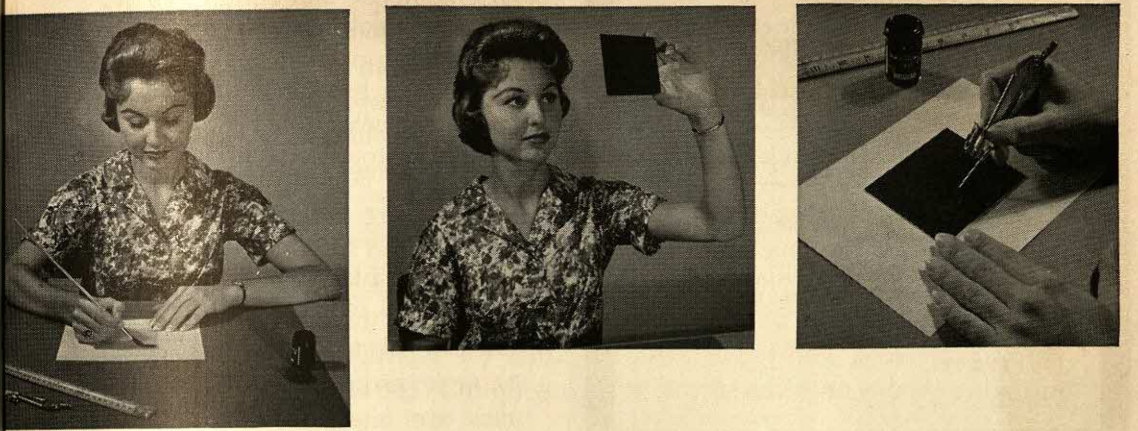
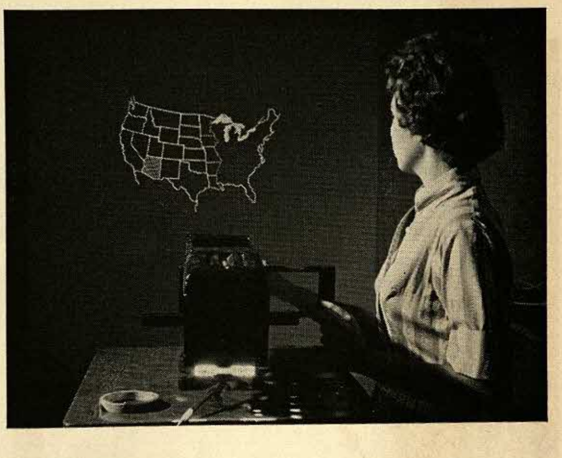


Fig. 12.14. A simple and effective technique for making negative-type slides with clear glass and black tempera paint.



from a Bureau of Visual Instruction such as the one in the University of Wisconsin Extension Division. Many audiovisual centers got their start in the slide business.

Although now largely replaced by the more convenient 2″ x 2″ slide, the 3¼″ x 4″ slide still has distinctive applications in instruction. It has two chief advantages over the smaller 2″ x 2″ slides. Since the surface of the slide is nearly 5½ times as large,[10] larger and more detailed images can be projected without loss of definition through diffusion. Reproductions of large maps, complicated charts and diagrams, tables, and other material in which printing and fine detail are important can be presented more effectively on the larger slides.

A second advantage of this size is that slides can be handmade (see Fig. 12.13). Many interesting and worthwhile learning experiences are possible in making and using handmade slides. They can be made rather easily on etched glass, translucent plastic, cellophane, or clear glass, to name a few of the more common materials (Fig. 12.14). Brooks summarizes the values and uses of handmade slides as follows:

> Handmade lantern slides are useful as teaching aids, and in the hands of a skillful teacher they become effective tools. Pupils can use the slides for reports,

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[10] The projected area of a 3¼″ x 4″ slide is 6.75 square inches; that of a 2″ x 2″ slide (double-frame) is 1.23 square inches.

for summaries, and for enriching projects through pictorial means. They can be used for presenting or previewing new material, supplementing and enriching material already in use, motivating interest, serving as a background for discussion, testing, reviewing, and summarizing. Materials which are not available or easily accessible for projection from other sources can be transferred to the slide.[11]

THE TACHISTOSCOPE TECHNIQUE. Remedial reading and arithmetic materials have been developed commercially for use on a 3¼″ x 4″ overhead slide projector equipped with a tachistoscope (Fig. 12.15). This attachment is also available for 2″ x 2″ slide projectors and for some specialized filmstrip projectors. The tachistoscope enables the instructor to flash word or number groups onto the screen at speeds up to 1/100 of a second. A refine-

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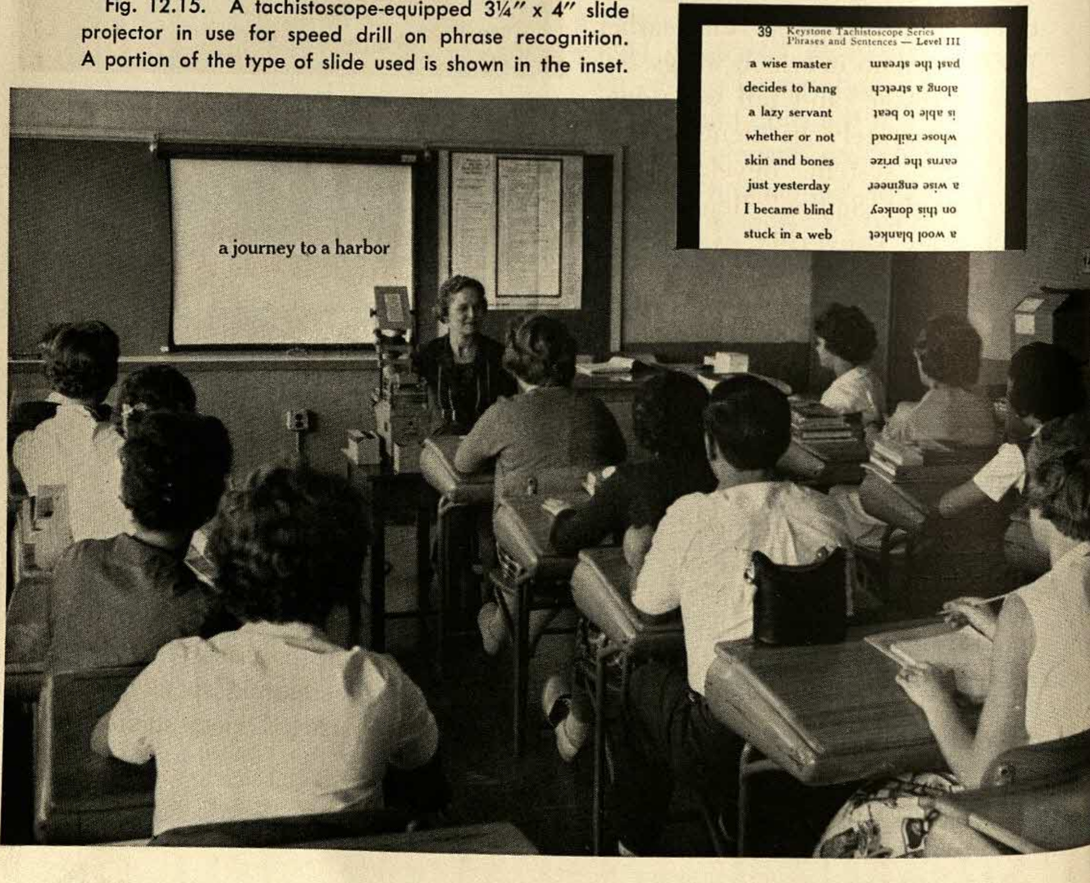
[11] Mary Esther Brooks, "Lantern Slides and How to Make Them," *See and Hear*, April, 1946, pp. 65–66.

See also the 16mm. sound films *Handmade Materials for Projection and How to Make Handmade Lantern Slides* (both Indiana University) for details of preparing teaching materials for overhead, slide, and opaque projection.



39 Keystone Tachistoscope Series
Phrases and Sentences — Level III

a wise master
decides to hang
a lazy servant
whether or not
skin and bones
just yesterday
I became blind
stuck in a web

past the stream
along a stretch
is able to beat
whose railroad
earns the prize
a wise engineer
on this donkey
a wool blanket

a journey to a harbor

Fig. 12.15. A tachistoscope-equipped 3¼″ x 4″ slide projector in use for speed drill on phrase recognition. A portion of the type of slide used is shown in the inset.

ment in the tachistoscope technique is provided by a device which holds a constant reference point on the screen for the student and keeps the image lighted but out of focus except for the split-second exposure desired (Fig. 12.16). This technique is reported as eliminating retinal afterimages. Aside from the motivational effect of these devices, their proper use appears to result in a significant improvement in speed of reading and number recognition.

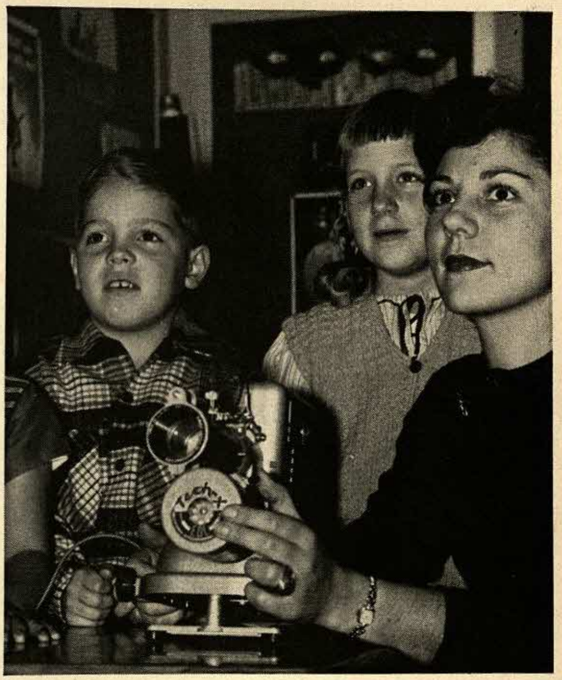


Fig. 12.16. Tachistoscopic training with filmstrips. A second projector is a controlled reader used for rate acceleration training.

The tachistoscope technique was used extensively during World War II for aircraft recognition training; it replaced the earlier WEFT system in which wings, engine, fuselage, and tail were analyzed separately in identification. The new system, developed by psychologist Samuel Renshaw of Ohio State University, was based on total perception of visual elements rather than on step-by-step perception. Thus the aircraft is seen as a whole rather than in terms of wings, an engine, a fuselage, and a tail. In other words, the whole is something more than the sum of its parts and is seen as such. This is a basic concept of such Gestalt psychologists as Wertheimer, Kohler, and Koffka.[12]

The Renshaw system employed thousands of photographs of airplanes on 2″ x 2″ slides. The planes were pictured in as many different positions, angles, distances, and conditions of visibility as could be secured. The slides were projected slowly at first, and then for progressively smaller fractions of a second. Pilots, gunners, and other military personnel became adept at recognizing aircraft almost instantaneously after sufficient practice with the tachistoscope technique for flash recognition to become habitual.

The latter point appears to be crucial in increasing reading speed and perceptual span with a tachistoscope or other accelerating devices such as the Iowa Reading Training Films and the Harvard Films for the Improvement of Reading.[13] Expert use on the part of the instructor is called for, including short follow-up practice sessions for the student, and a high level of motivation to maintain increased speeds. For, as Stroud points out in discussing the film programs, ". . . if the student tires, as he must in longer periods, he will have a tendency to revert to a slower and more comfortable rate. After the faster rate becomes habitual, it is no more tiring than a slower rate. Effort requires motivation. Here the attempt is made to arrange conditions so the student will practice reading in a different way. Mere practice, reading in the accustomed way, will only maintain the status quo. One learns by practice what he practices."[14]

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[12] For an interesting summary of the principles of Gestalt psychology in relation to perception and insight, see James B. Stroud, *Psychology in Education,* Longmans, Green, New York, 1956, pp. 359–369.

A number of reading rate accelerators of various types are also available. In some of them a slide or filmstrip projector is used. Fig. 12.16 above shows one of these; the materials used are on filmstrips. This system controls the reading rate (0 to 1000 words per minute) by means of a slot and a left-to-right scanning mechanism.

POLAROID SLIDES. Development of the Polaroid transparency within the last few years has made possible another significant use of 3¼″ x 4″ slides. With this film and a Polaroid camera, the instructor can make a slide of any desired subject in a few minutes, place it in the plastic holder provided for this purpose, and project it immediately.

2″ x 2″ Slides. Since the development of the 35mm. camera and color film, photography has become a national pastime and the 2″ x 2″ slide has become a valuable and popular teaching tool. An important advantage of both filmstrips and 2″ x 2″ slides is the fact that excellent color quality is possible at low cost. Considerations regarding the educational value of color and the selection of colored slides and filmstrips are the same as were discussed in connection with flat pictures (Chapter 4), display boards (Chapter 6), and 16mm. sound motion pictures (Chapter 13).

The instructor can make his own slides with maximum ease because the exposed films come back from the processor in cardboard slide mounts ready for projection. He can take pictures of field trips, laboratory experiments, class activities, travel scenes, or any subject that lends itself to photographic treatment.

Convenience of use, quality, low cost, and ease of procuring are among the principal reasons for the great popularity of 2″ x 2″ slides. The convenience of handling and storing small, light-weight slides is apparent. Furthermore, these slides can frequently be projected in the same machine that is used for filmstrips. A convenient method of sorting slides and selecting those needed for a lesson is shown in Fig. 12.17.

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[13] Bureau of Audio-Visual Instruction, State University of Iowa; and Harvard Films Service, Biological Laboratories, Harvard University.

[14] James B. Stroud, *op. cit.*, p. 153.

The 2″ x 2″ photographic slides made commercially are of excellent quality, satisfactory for classroom or auditorium use. Commercially produced slides of this size are also available on a great variety of subjects such as art, bird study, foreign and domestic geography, history, literature, health conservation, home economics, meteorology, and zoology.[15] Typical sources are listed on pages 482–483. Color slides have little "grain" and hence can be projected in considerable size without loss of satisfactory definition.

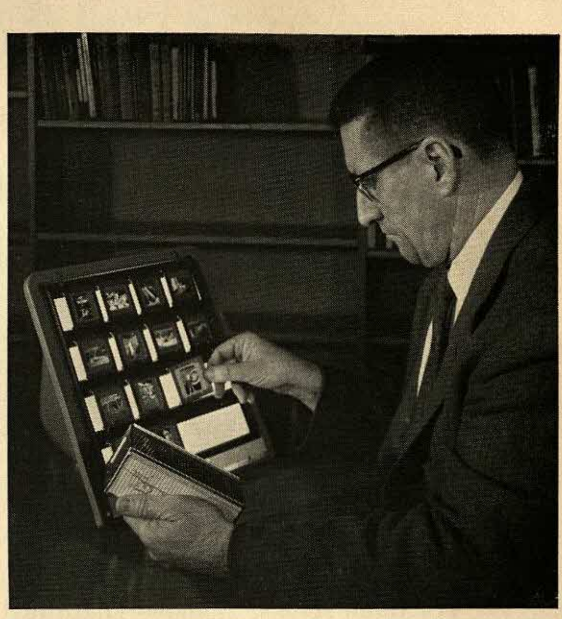

Fig. 12.17. A light-box is of great assistance in sorting and selecting 2″ x 2″ slides. They can be placed in cartridges to assure correct order in projecting them.

Overhead Transparencies. One of the most significant developments in still projection devices is the overhead transparency projector (Fig. 12.18). Similar in principle to the overhead slide projector (Fig. 12.15), it has a variety of highly practical applications in the classroom, in industrial training, and in presentations by speakers.

NATURE AND ADVANTAGES OF OVERHEAD PROJECTION. The overhead transparency projector transmits a strong beam of light through a transparency and onto a screen behind the instructor, who is at the front of the room, facing his class (Fig. 12.19). The light is reflected through a large plastic lens, which directs the light through the transparency into a second reflector above, and on out to the screen (Fig. 12.20). The light is sufficiently brilliant so that little room darkening is required. The operation of the projector is very simple; little more is involved than placing the transparency on the projector stage. The material is focused by raising or lowering the upper reflector unit by means of turning a knob. The projection area is commonly 7″ x 7″ or 10″ x 10″ in the several models available.

The transparencies are plastic, carbon, cellophane, or acetate sheets. The materials that can be used on this projector are virtually unlimited. Any-

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[15] A particularly helpful annual publication on commercial sources of 2″ x 2″ slides is a booklet by Elsie P. Heyl, *Where to Buy 2″ x 2″ Slides: A Subject Index,* available from the Enoch Pratt Free Library in Baltimore.

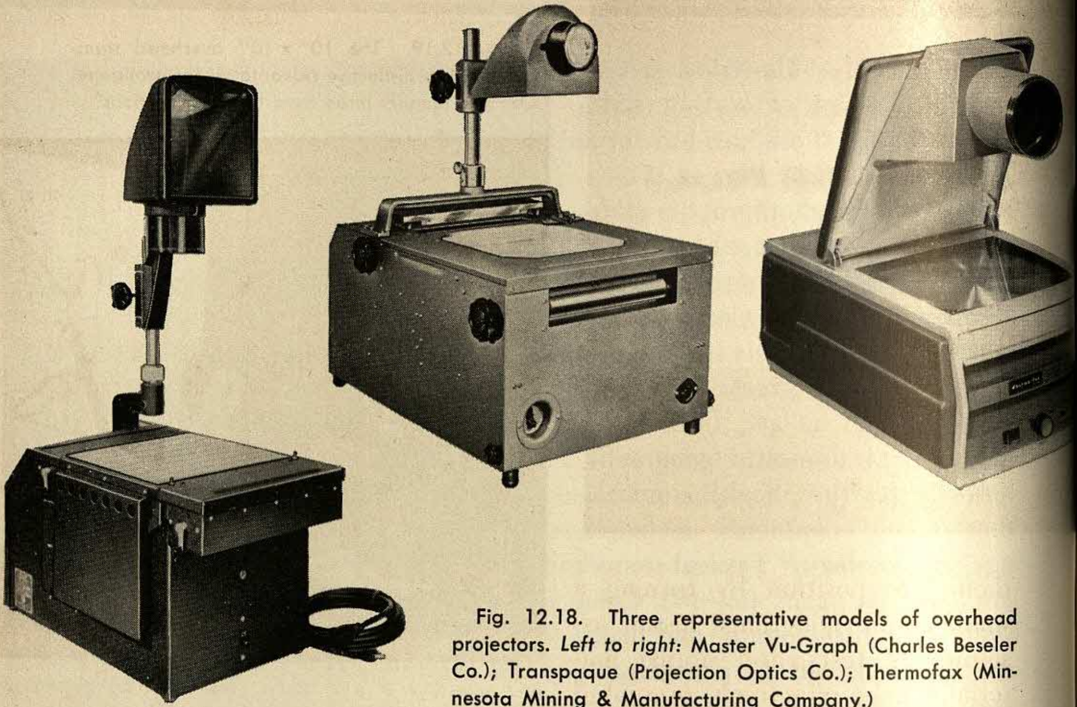


Fig. 12.18. Three representative models of overhead projectors. *Left to right:* Master Vu-Graph (Charles Beseler Co.); Transpaque (Projection Optics Co.); Thermofax (Minnesota Mining & Manufacturing Company.)

thing that can be traced, drawn, written, typed, or photographed on a transparency can be projected clearly on the screen. The teacher can make his own transparencies without a darkroom or other unusual paraphernalia. Transparencies are available commercially, and they can also be made up at low cost by such an agency as a university audiovisual center.

The fact that the overhead projector is operated from the front of the room enables the teacher to face his class and maintain direct eye contact with his pupils at all times. From his position beside the projector he can indicate a point on the transparency or write or draw on it, the material being projected on the screen as he does so.

In addition, he can present his material one step at a time by means of overlays, for this is the one type of projector that the overlay technique can be used with effectively. Successive layers of transparencies in black and white or color, or both, can show progressive stages of development, sequences, and sectional views. Lettering, mechanical drawings, the various steps in completing a map or assembling a machine, and cumulative additions to a chart or graph are typical of the many possible classroom uses of transparent overlays.

A feature that appeals to most teachers is the cellophane roll that is built into the projector. The teacher can prepare panels ahead of time and roll

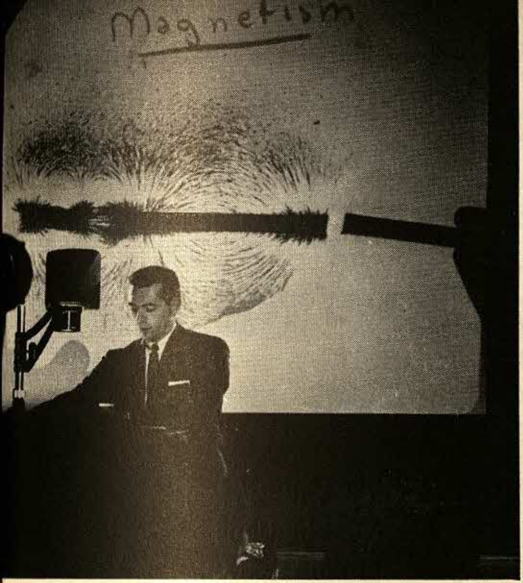
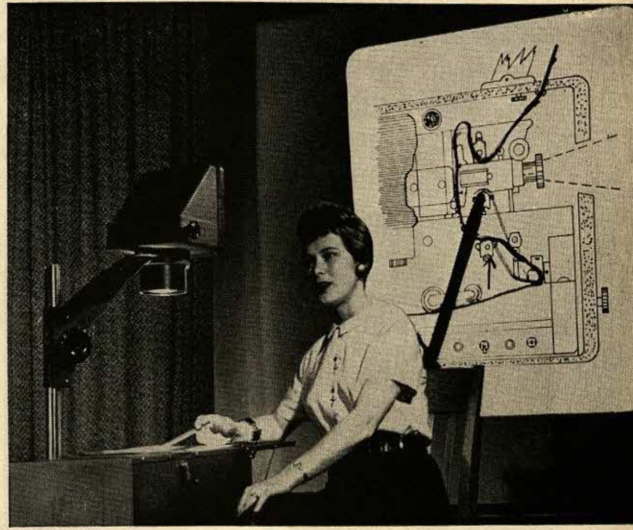


Fig. 12.19. The 10″ x 10″ overhead transparency has distinctive advantages for group use. Can you identify three from these illustrations?



them into position by turning a small crank. Diagrams, lesson assignments, tests, and similar material can be effectively presented in this way with a minimum of time and effort.

A unique development in connection with the overhead projector is the use of polarized light to create an effect of animation on projected transparencies. This involves a motor-driven polarized disk beneath the projector head, and polarized strips on the transparency itself. The disk revolves, causing the light and color patterns to change rapidly; this gives the effect of animation. This device is useful for providing animated diagrams, graphs, lettering, or other display material; however, it is somewhat expensive for regular classroom use.

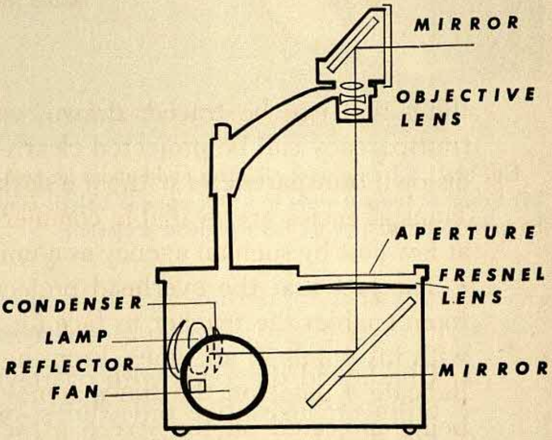


Fig. 12.20. Diagram of the overhead projection system.

THE "LIFT TECHNIQUE." It is possible to "lift" color photographs from most magazines by a process that transfers the ink from the paper to a plastic surface. This is done most conveniently by applying a special acetate sheet to the surface of the picture and inserting both briefly in a hot press. The material is then soaked in water to which a detergent has been added, and left until the paper can be pulled gently from the acetate surface to which the colored ink has now adhered. This surface is then washed carefully and allowed to dry. When dry, it is sprayed with a colorless protective coating, which also brings out the colors more strongly, and the transparency is ready for projection.[16]

USES OF OVERHEAD TRANSPARENCIES. A variety of practical day-to-day uses of overhead transparencies has probably occurred to you. The following suggestions from Hartsell and Veenendaal[17] may increase your list:

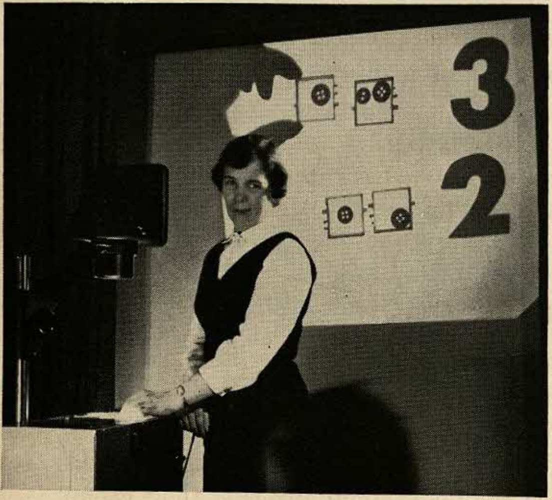


Fig. 12.21. Transparent pillboxes and buttons for number exercises suggest ways in which opaque objects may be used to advantage on the overhead projector.

Elementary

1. Number combinations on rotating disks grommeted together to replace a whole stack of flash cards.
2. Transparent boxes and buttons for work in number combinations (Fig. 12.21).
3. Outline maps for geography, with symbols added or overlays used for names, locations, etc.
4. Words in sentences cut into transparent strips for studying parts of speech or punctuation.
5. Photographic "lifts" for reading readiness or experience charts.

Secondary

1. Charts and diagrams with overlays to show division of powers in government, legislative procedures, or due process of law.
2. Overlays for rapid comparison of geometric figures, for proof of theorems, etc.
3. Solutions of complex problems in mathematics or accounting prepared by means of overlays to save the time of both class and teacher.
4. Small science charts transferred to transparencies for improved visibility

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[16] The special acetate sheets can be obtained from Seal, Inc., Shelton, Connecticut, and from the Minnesota Mining & Manufacturing Company. See also H. C. Hartsell and Wilfred Veenendaal, *Overhead Projection*, Henry Stewart Co., 1960, for an excellent discussion of specific uses of transparencies and their preparation by the teacher. For demonstrations of their use and techniques of preparation, see *The Overhead Projector*, Sound, B&W, 18 min., State University of Iowa; and *Handmade Materials of Projection*, Sound, Color, 20 min., University of Indiana.

[17] H. C. Hartsell and Wilfred Veenendaal, *op. cit.*, pp. 38–50.

and convenience. These can be marked without damage for purposes of explanation.

5. Comparison of foreign and English language sentence structure by means of overlay or uncovering techniques. The same comparison methods for vocabulary tests and drills.
6. Letter-writing models, shorthand exercises, and bookkeeping forms for business education classes.
7. Plastic models to illustrate gear ratios, jointing, and fitting in industrial arts classes.
8. A music staff under the cellophane roll for addition of clef, signature, and notes for simple composition. Transfer of a musical score to a transparency for concert audience to follow.
9. Scale drawings of playing fields or courts placed under the cellophane roll on which plays can be sketched; silhouette cutouts or transparent plastic pieces representing positions to be manipulated at will.

OTHER TYPES OF STILL PROJECTION

Although filmstrips, slides, and transparencies are more familiar, other types of still projection should not be overlooked, for each one has unique and significant instructional advantages. These additional types include opaque projection, microprojection, and stereoprojection. The stereodisks and viewers and microfilms and cards are for individual rather than group use but belong in this general classification and will be discussed briefly.

OPAQUE PROJECTION

Potentially, one of the most useful types of still projection for instructional purposes is opaque projection. It permits nontransparent materials such as flat pictures, book illustrations, tables, drawings, photographs, pupils' work, and even certain specimens and objects to be shown on a screen for group observation.

The instructor with access to an opaque projector has available an almost unlimited amount of illustrative material at little or no cost. Furthermore, much of this material can be used just as it is, for a minimum of mounting or other preparation is required. A theme, a mathematics paper, a sheet of typing, a page or diagram in a book, a picture in a magazine, a culture dish, a watch, coins, stamps or leaves—in fact, nearly anything that is within 8½″ x 11″ in size—can be projected by an opaque projector.

Physical Characteristics. Opaque materials are projected by means of reflected light. The principle is that used in the old magic lantern. A strong

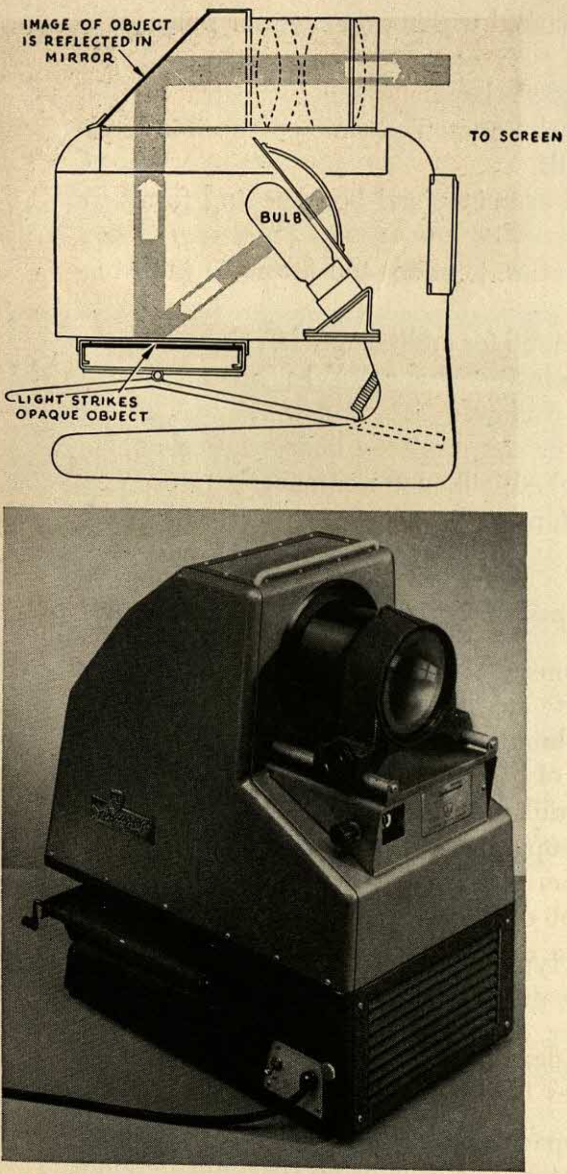
IMAGE OF OBJECT IS REFLECTED IN MIRROR
TO SCREEN
BULB
LIGHT STRIKES OPAQUE OBJECT

Fig. 12.22. From this diagram can you explain how the opaque projector works? Also shown is one of the several good 1000-watt opaque projectors available.

light from the projector lamp is thrown on a picture, and this picture is reflected by a tilted mirror through a lens and onto a screen (Fig. 12.22). The screen image is normally less brilliant than in the case of a slide or other transparency where the light passes directly through the picture. Highly satisfactory images can nevertheless be obtained if the room is reasonably well darkened. The lighting efficiency of the newer opaque projectors has been improved to the point where effective projection is possible in moderately darkened rooms.

These improved projectors have a 1000-watt lamp, an opening large enough to accommodate 8½" x 11" materials, and an efficient motor-driven cooling system. Down-draft ventilation holds loose or unmounted material in place without fluttering or loss of focus. A loose postage stamp, for example, can be projected without difficulty with this type of projector. When projecting a page in a book, a piece of heat-resistant glass will hold the page flat so that all parts of it can be focused sharply.

Advantages and Limitations. The principal and unique advantage of opaque projection in instruction is the great mass of readily available and cost-free materials which can be projected. Much valuable material such as pupils' written work and useful illustrations, diagrams, and tables from magazines and reference books can be projected as it is. Some three-dimensional materials can also be projected to advantage (Fig. 12.23; see also Fig. 4.23). Further, the instructor can change the sequence of these materials at will or leave them on the screen as long as he desires.

Another unique value of opaque projection is the convenience with which illustrative material can be enlarged and transferred to a chalkboard or chart. A small news map, for example, can be projected on a chalkboard in any desired size and quickly traced for a current events discussion.

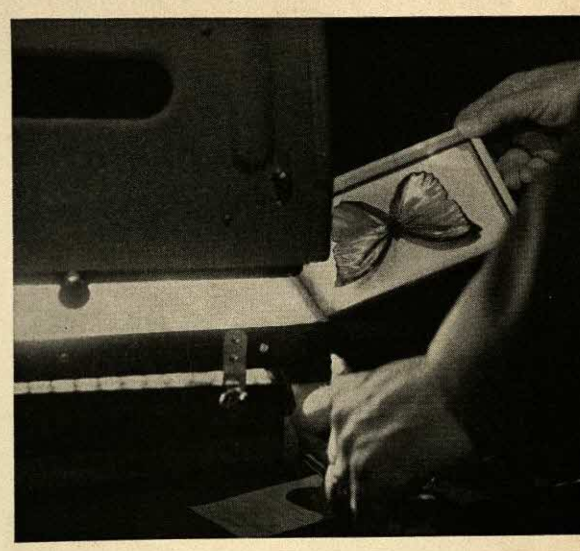

Fig. 12.23. Fragile specimens as well as flat materials can be shown readily in the opaque projector if they are covered to protect them from handling.

In addition, opaque projection has the attention-focusing advantage that any projected image has. Even when other methods of presentation such as charts or bulletin boards are used, the projected image creates added effectiveness by the enlargement it makes possible, and the fact that it focuses the attention of the entire group.

Reflected light is naturally less brilliant than direct light of the same initial intensity. Thus it is that the opaque projector normally requires a better-darkened room than most other projectors. Nevertheless, the newer opaque projectors do a remarkable job of illumination. In consequence, this type of projector holds real promise of achieving the prominent role in instruction that it so richly deserves.

Uses of Opaque Projection. The flexibility and convenience of opaque projection for a great variety of uses have been effectively illustrated by Denno[18] as follows:

Primary Grades

1. Language arts—Story sharing, animated word games.
2. Arithmetic drill—Pull strips that reveal numbers of objects.
3. Science—The enlarging of pictures to show size; the showing of collections of shells.
4. Social studies—Maps locating school and homes.

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[18] Ray Denno, *Using the Opaque Projector*, Squibb-Taylor, Inc., 1958, pp. 12–25.

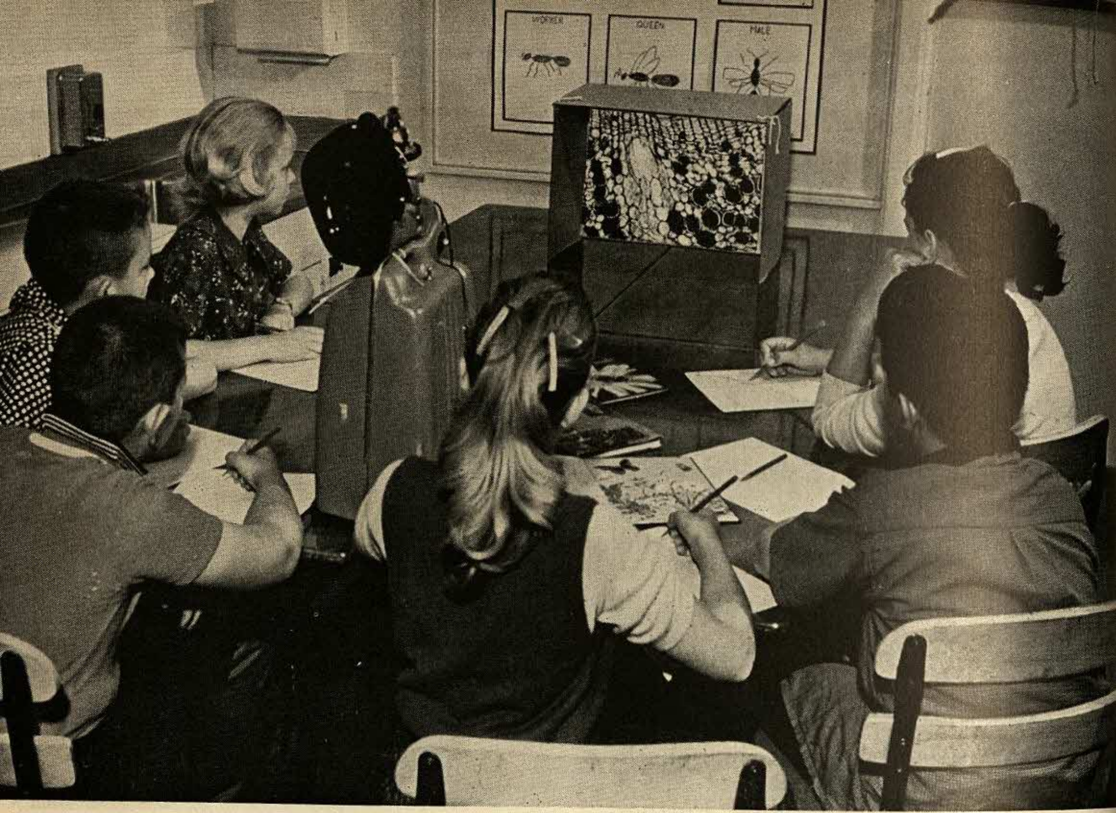

Fig. 12.24. For what purposes is a microprojector superior to individual microscopes?

Intermediate Grades

1. Enlarging figures for bulletin boards.
2. Science specimens; weather map symbols.
3. Test reviews.
4. Book illustrations.
5. Music—Sharing a song.
6. Mathematics—Diagrams, problems, exercises.

High School

1. Social studies—Map projection.
2. English—Creative writing, correction of grammar on written work; letter forms.
3. Civics—Current maps and pictures.
4. Art—Drawing techniques, illustrations.
5. Science—Specimens.
6. History—Reference pictures, artifacts.

College

1. Business education—Business and accounting forms.
2. Journalism—Creative writing, advertising layouts.
3. Home economics—Textiles.
4. Fine Arts—Photos, graphs, charts, instruments, drawings, illustrations for various subject areas.

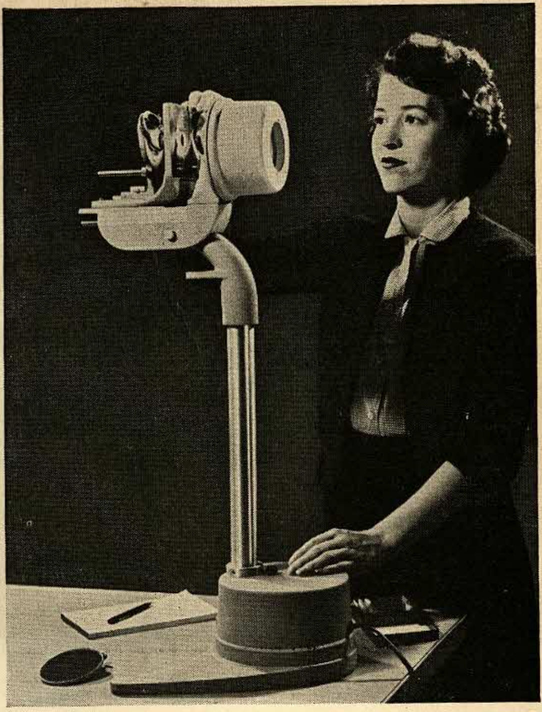

Fig. 12.25. A microprojector set up for group use.

MICROPROJECTION

One of the more specialized types of projection equipment is the microprojector (Figs. 12.24 and 12.25). As its name indicates, this projector is designed to project microscope slides so that an entire class may see what would be visible to only one pupil at a time if seen under a microscope. Furthermore, both wet and dry slides may be projected.

Among the particular advantages cited for the microprojector are the following: (1) It minimizes the need for expensive microscopes for each student, (2) it presents a greatly enlarged picture of the object on the slide, and (3) it assures the instructor that his students are seeing precisely what he wants them to see.

Numerous phenomena suited for presentation on microscope slides can be shown with marked effectiveness on a microprojector. Sargent[19] lists such uses as the following:

1. Illustration of stresses and strains on fibers, filaments, and surfaces.
2. Physical examination of wood, cotton, silk, rayon, linen, and other textile fibers.
3. Gross projection of prepared slides showing fingerprints or other semi-transparent print materials such as blood smears.
4. Visualization of interference patterns of light, and optical principles of refracted light.
5. Gross examination of properties of crystals and other common compounds

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[19] Theodore Sargent, "Using the Microprojector in Physics and Chemistry," in Harry C. McKown and Alvin B. Roberts, *Audio-Visual Aids to Instruction,* McGraw-Hill, New York, rev. ed., 1949, pp. 512–513.

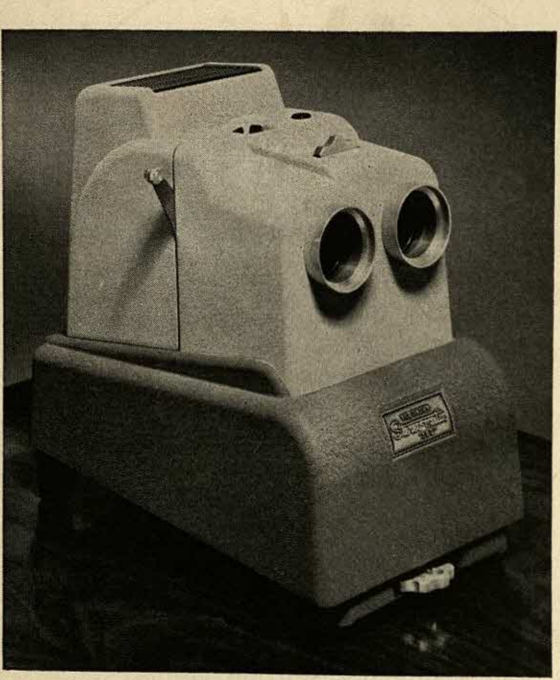


Fig. 12.26. A stereoprojector.

such as minerals, food, rubber, and petroleum by means of white and polarized light.

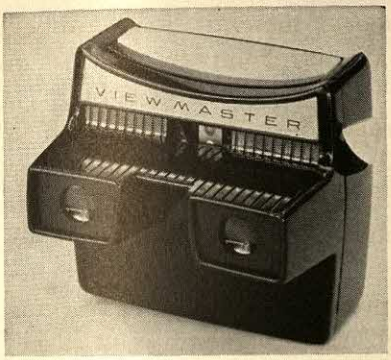
6. Projection of crystal growth in solutions such as ammonium chloride, sodium nitrate, copper sulfate, potassium dichromate, and potassium chlorate. Removal of the projector cooling cell causes melting. Replacement of the cell results in crystallization which can be shown without changing the field of projection.
7. Projection of one-celled animals and plants in solution, cell division, plant and animal tissues, bacteria, mold spores, and the like.

Virtually all prepared microscope slides now available can be projected with the microprojector. However, the light beam must be cooled sufficiently to prevent damaging the material on the slide.

STEREOPROJECTION

The projection of stereographic views so that a group can see a scene in the lifelike realism of three dimensions was long a goal that has now been attained (Fig. 12.26). The process is being used for certain specialized purposes, but is not yet used in schools to any appreciable extent. Transparencies for this purpose are prepared in pairs from photographs taken with a stereographic camera. This camera takes two pictures simultaneously; since the camera lenses are a few inches apart, each picture is taken from a slightly different angle. When both pictures are seen together in a stereoviewer, a highly realistic and vivid three-dimensional effect is obtained. However, a pair of specially designed glasses is necessary for each observer to perceive the three-dimensional image when projected; for when a pair of stereographic transparencies is thrown on a screen with a projector, both pictures are seen by both eyes. The result is a confused agglomeration of vaguely defined images.

Certain technical problems must be solved before stereographic projection



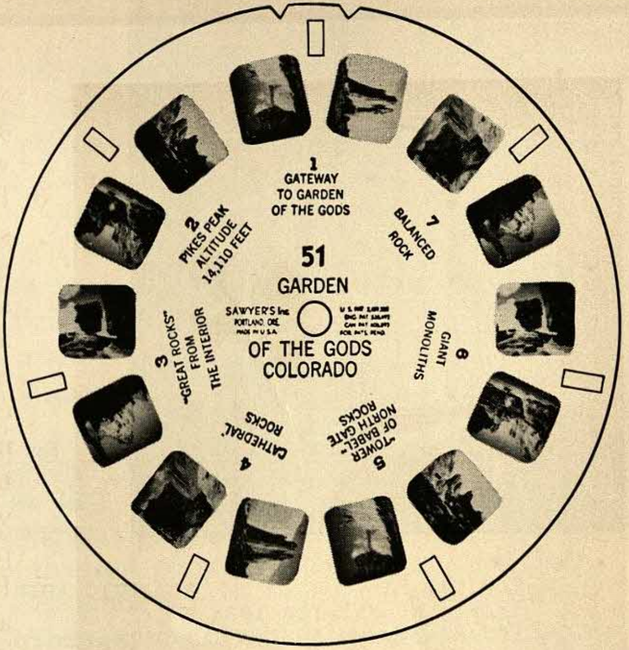


Fig. 12.27. A popular type of stereoviewer; beside it is a stereograph consisting of pairs of 16mm. transparencies on a disk. What are the teaching values of stereoviews?

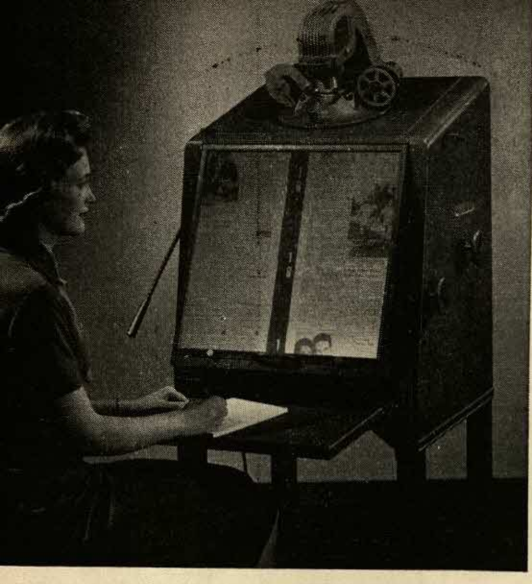
can be satisfactory. There is a tendency, for example, toward overexaggeration of depth in close-up views, and a similar distortion around the edges of a picture. Thus, the stem of a tulip near the edge of the picture may seem considerably longer than the stems near the center, though actually all are approximately the same length. The effect persists even though a special spheroid screen is used.

The special screen and glasses required are additional drawbacks to stereographic projection for most instructional purposes. However, for certain specialized purposes such as surgical, art, and engineering training, the values of three-dimensional projection are important enough to merit its use.

STEREODISKS AND STEREOVIEWERS

A modern form of the stereograph is the stereodisk. Seven pairs of 16mm. transparencies taken in a stereographic camera are mounted on flat disks and viewed in a compact and inexpensive viewer (Fig. 12.27). The left eye sees one picture and the right the other; the brain combines them into one three-dimensional image.

Initially, these stereodisks (or reels) were devoted largely to entertainment and general interest; they showed such subjects as children's stories, scenic wonders, world travel, nature, and world events. The success of the device has led to several more serious applications of a scientific and technical nature such as medical work, an atlas of human anatomy, oral surgery, and air contamination. A number of books have been published whose illustrations are on stereodisks; a folding plastic viewer is a component of



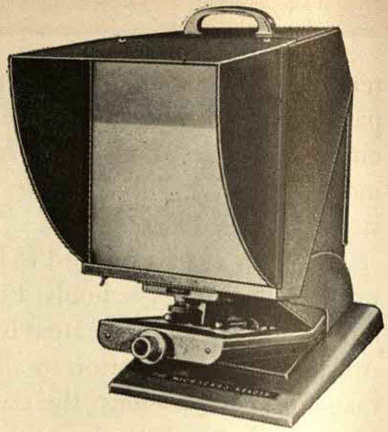
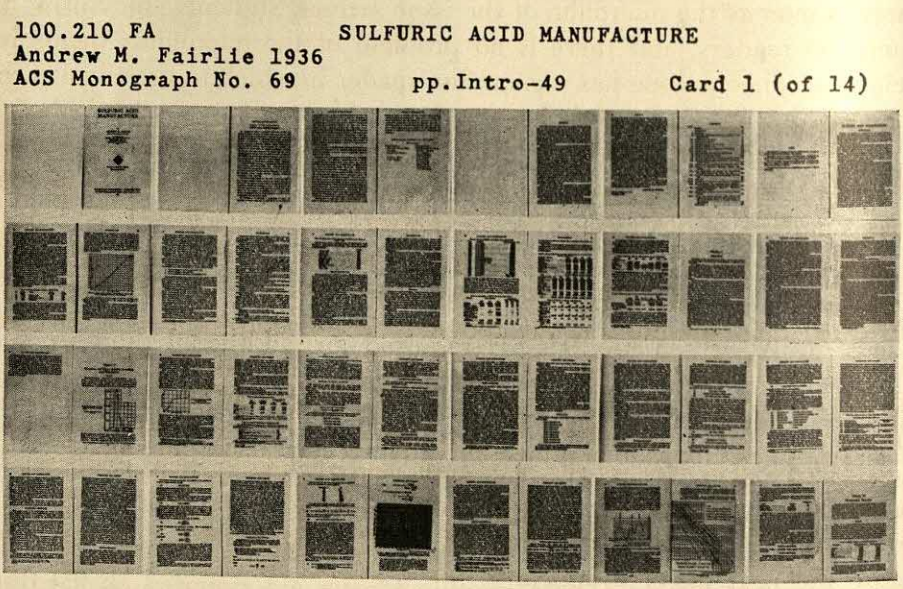


Fig. 12.28. Two models of microreaders—one film, the other card. What possibilities do you see for using microreaders in public-school programs?



100.210 FA SULFURIC ACID MANUFACTURE
Andrew M. Fairlie 1936
ACS Monograph No. 69 pp.Intro-49 Card 1 (of 14)

the text, along with the stereodisks. The producer has also published some classroom materials, and additional developments may be expected along these lines.[20]

MICROFILMS AND CARDS

As the volume of publications increases, the physical problems of storing and retrieving information become increasingly difficult. Accordingly, in recent years, certain types of publications such as rare books, theses, newspaper files, important documents, and periodicals have been photographed on 35 mm. microfilm. Each frame is a separate page. The film is read by means of a microfilm reader. In a similar system small cards are used instead of film (Fig. 12.28).

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[20] Sawyer's Correlated Classroom Materials (for primary grades), Sawyer's, Inc., Portland 7, Oregon.

Although at first limited to large libraries, microfilming is now being used in some secondary schools. Erbes points out significant advantages, for example, in its use in the Reavis High School Library in Oak Lawn, Illinois.[21] A microfilm subscription to all current periodicals is ordered along with the magazines themselves; the cost is about the same as for binding the magazines at the end of the year.

The microfilm solves the magazine storage problem, relieves the librarian from worry about current issues that have disappeared, and practically eliminates the problem of missing pages. Magazines can be cut up for pictures as soon as the microfilm of the issue arrives. Students enjoy using the microfilm readers, and there is no problem of the microfilms themselves being lost since no one has a microfilm reader in which to use them. Erbes suggests that "when considering purchase of microfilms, a school librarian consider not only the expense of purchase, but also the long-range saving of money, time, and patience in using this modern, practical way to house back numbers of magazines and periodicals."[22]

Future developments in microfilm storage and retrieval systems promise to be extensive—and significant for teachers and students alike. A system of electronic microfilming is being studied with a sizable grant from the Council on Library Resources in Washington, D.C. In this system, a series of central archives over the nation would contain microcards of all publications of a certain type. Each microcard would hold approximately 10,000 pinhead-sized pages. By means of a code and dialing system, a library—or presumably an individual—could request any reference and it would be transmitted electronically to a small TV screen. Pushing a button would cause the next page to appear.[23]

SUMMARY

Still projection makes possible group examination of individual pictures and illustrative materials for as long as the teaching purpose requires. It also has the attention-focusing power of any projected image. Together these advantages make for a powerful and effective teaching medium when motion is not essential to comprehension.

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[21] R. G. Erbes, Jr., "Microfilm in High School Libraries," *Wilson Library Bulletin*, December, 1958, pp. 302–303.

[22] *Ibid.*

[23] Hyman M. Boodish, "Automation in Education: Electronic Microfilm Archive," *Social Studies*, December, 1959, pp. 264–265.

There are various forms of still projection such as filmstrips, 2″ x 2″ and 3¼″ x 4″ slides, opaque projection, overhead transparency projection, microprojection, and stereoprojection. In addition, and primarily for individual use, there are stereodisks and microfilms. Each of the above forms has unique advantages and uses in instruction.

As with other audiovisual materials, the effectiveness of still projection media depends to a large extent on how they are used. In general, the familiar principles of all good teaching apply: preview and selection of the most appropriate materials; class preparation, including motivation and direction on what to look for; good projection conditions; and follow-up, including testing, application, and reteaching as needed. Good procedure is flexible rather than rigid; it adapts itself to the requirements of the individual learning situation.

Thorough familiarity with the various still projection media and materials will enable the teacher to apply each of those available to him so as to achieve maximum learning.

Suggested Activities

1. As a committee or individual project, have units of work in a given subject and grade area analyzed as to (a) where still projection materials could make significant contributions to learning, and (b) what specific materials could do the job.
2. Survey the still projection equipment and facilities of your school and prepare a report for your principal or superintendent that includes:
   a. Present status.
   b. Recommended additions and changes for next year.
   c. Recommended changes and additions for the next five years. Draw up supporting statements for your recommendations.
3. As a building director of audiovisual instruction you have been concerned for several years about the tendency of most of your teachers to use motion-picture films rather than available still projection materials, regardless of the latter's superiority in many teaching situations. You get permission from your principal to call a faculty meeting for the purpose of "educating" your teachers regarding the potentialities of one or two types of still projection. Prepare a demonstration for your audiovisual class showing how you might do this.
4. Divide the class into committees and have each one prepare a demonstration showing interesting applications of one of the following: (a) the opaque projector, (b) handmade slides, (c) the filmstrip projector, (d) 2″ x 2″ slides, (3) 3¼″ x 4″ slides, (f) the microprojector, (g) the overhead transparency projector, or (h) a stereoviewer.

5. In order to give class members information about various types of still projection equipment, ask an interested group to write for literature in sufficient quantities so that each member will have individual copies. If feasible, arrange with your local dealer to demonstrate several makes of equipment during a laboratory period or outside of class. Report to the class your reactions concerning new ideas and the strong and weak points of the equipment demonstrated.

Bibliography

Anderson, I. H., "Still-Projection Methods in the Teaching of Reading," *Educational Screen,* June, 1946, pp. 293–294.

Bastion, J. W., "Slides and Tape in Language Teaching," *Educational Screen,* October, 1953, p. 347.

Bell, K., "The Making and Use of Slides for the Teaching of Mathematics," *18th Yearbook,* National Council of Teachers of Mathematics, 1945, pp. 289–293.

Booher, Edward H., "Textbook Publishing—An Art Extended," *Audiovisual Instruction,* January, 1961, pp. 15–18.

Bridges for Ideas: 10. *The Opaque Projector,* Visual Instruction Bureau, Univ. of Texas.

Brown, J. W., Lewis, R. B., and Harcleroad, F. F., *Audio-Visual Instruction,* McGraw-Hill, 1959, pp. 138–156, 424–426, 431–448.

Dale, Edgar, *Audio-Visual Methods in Teaching,* Dryden, rev. ed., 1954, pp. 258–268.

Finstad, Allan, *Vu-Graphics, a Manual on Vu-Graph Projection,* Charles Beseler Company, 1952.

Hamilton, G. E., *How to Make Handmade Lantern Slides,* Keystone View Company, 1952.

Hartsell, H. C., and Veenendaal, Wilfred, *Overhead Projection,* Henry Stewart, Inc., 1960.

Keystone Tachistoscope, Advanced Teaching Techniques, Keystone View Company, 1956.

Kinder, James, *Audio-Visual Materials and Techniques,* American Book, 2nd ed., 1959, pp. 99–154.

Robinson, M. M., "Using the Opaque Projector in Teaching Composition," *English Journal,* October, 1946, pp. 442–445.

Sands, Lester B., *Audio-Visual Procedures in Teaching,* Ronald, 1956, pp. 270–343.

Sands, Lester B., "Films and Filmstrips for Arithmetic," *Grade Teacher,* February, 1960, pp. 25 ff.

Sands, Lester B., "The Overhead Projector—A Fresh Approach to Slide Projection," *Grade Teacher,* November, 1957, pp. 52 ff.

Siergiej, E. J., "Using the Opaque Projector in Tool Subjects," *Instructor,* June, 1953, pp. 92–93.

Taylor, G. M., "A Lantern-Slide Projector as a Construction Project," *18th Yearbook,* National Council of Teachers of Mathematics, 1945, pp. 304–317.

Taylor, J. Y., *Opaque Projection, a New Frontier in Teaching,* American Optical Company, 1941.

Thomas, R. Murray, and Swartout, Sherwin G., *Integrated Teaching Materials,* Longmans, Green, 1960, pp. 160–184, 234–238.

Thompson, J. H., "Colored Slide Collection for Geography Teachers," *Journal of Geography,* March, 1954, pp. 117–123.

Walter, Frank, "A Picture Strip for the Opaque Projector," *Educational Screen,* October, 1946, pp. 439 ff.

Warner, M. E., "Overhead Projection for Teaching Drafting," *Industrial Arts and Vocational Education,* December, 1953, pp. 350–353.

Washcoe, W. C., "The Versatile Overhead Projector," *Educational Screen and Audiovisual Guide,* May, 1959, pp. 242–244.

Whitcomb, M. W., "Opaque Projector in Teaching Music," *Music Educators Journal,* April, 1954, pp. 65–66.

Wimmer, M., "Microscopic Projection and Micro-Photographic Slide Making," *Educational Screen,* January, 1939, pp. 8–9.

Films

Handmade Materials for Projection, Color, 20 min., Indiana University.

High Contrast Photography, Color, 21 min., Indiana University.

How to Make Handmade Lantern Slides, Color, 22 min., Indiana University.

Overhead Projector, B&W, 16 min., State University of Iowa.

The Opaque Projector—Its Purpose and Use, B&W, 6 min., State University of Iowa.

Filmstrips

Enriching the Curriculum with Filmstrips, 60 frames, B&W, Society for Visual Education, Inc.

Filmstrip Preparation, 78 frames, B&W, United World Films.

Handmade Lantern Slides, 50 frames, Color, Ohio State University.

Introducing Filmstrips, 29 frames, B&W, National Film Board of Canada.

Simplified Filmstrip Production, 40 frames, B&W, Ohio State University.

Slidefilm in Teaching, 46 frames, B&W, Young America Films.

Teachers Consider Filmstrips, 27 frames, Color, Eye-Gate House.

Teaching with a Filmstrip, 50 frames, B&W, Society for Visual Education, Inc.

CHAPTER 13

THE 16MM. SOUND MOTION-PICTURE FILM

To understand our world, we need to "see" everything, everywhere, look into the past and examine the future, and, on occasion, temporarily acquire a kind of "supersight" which permits us to slow down or speed up, enlarge or diminish natural and scientific occurrences. Today, much of this kind of experiencing can become part of classroom learning through the 16mm. sound motion-picture film (Fig. 13.1).

Sound motion-picture films enable teachers to fulfill their demanding function. The social studies teacher must help his pupils learn about the farthest reaches of the earth and space. The science teacher must help his students understand all manner of natural phenomena. The history teacher must help his class understand the events of the past and present. The language teacher must help his pupils understand the people and the cultural patterns which have produced a language; in addition, the language itself must be mastered.

This chapter traces briefly the background of the teaching film, describes how it re-creates the impression of lifelike motion and sound, explains the characteristics which make it a valuable learning experience, and describes some of the responsibilities the teacher assumes when he uses it in his classroom.

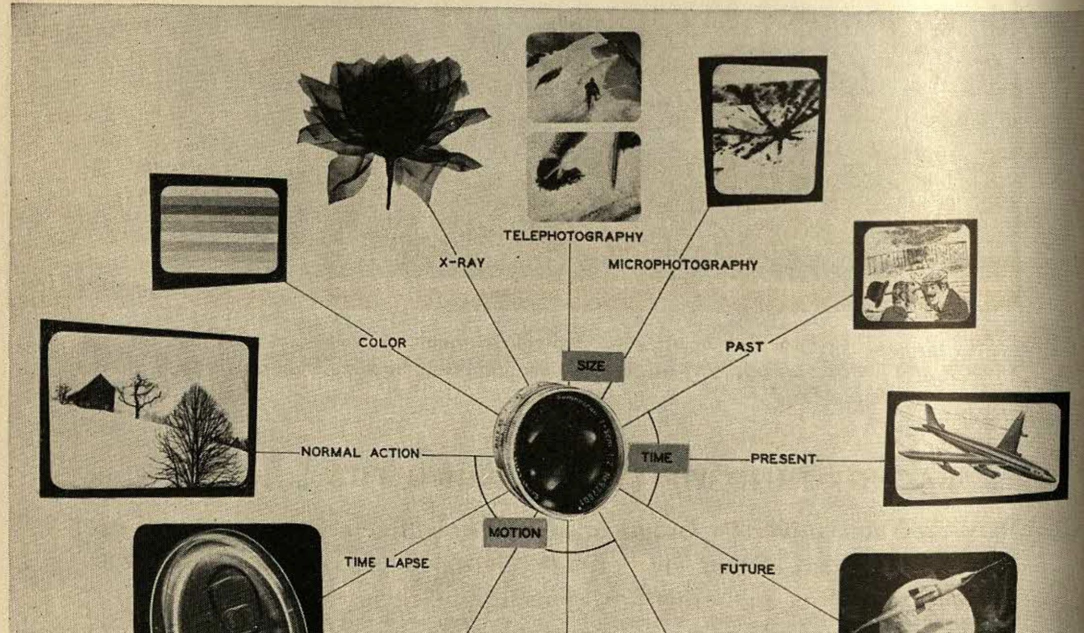

Fig. 13.1. 16mm. sound motion-picture photography and projection can provide kinds of learning experiences which have long been needed. Which of these communication innovations will help you improve the efficiency of classroom instruction?

Fig. 13.2. *The Chronicles of America Photoplays* sought to re-create important historical episodes in a lifelike manner. Why was one measurable result the stimulation of voluntary reading in American history?

BACKGROUND OF THE TEACHING FILM

In 1922, Yale University produced a series of fifteen silent motion-picture films in American history entitled *The Chronicles of America Photoplays.*[1] A board of editors, including historians and teachers, supervised every step in the writing of the scripts and the production of the films. Great care was taken to re-create costumes and props, and historic sites were actually rebuilt—everything was done that would realistically and correctly recapture the essence of the fifteen historic episodes depicted by the series (Fig. 13.2).

Research was conducted among schools in the eastern United States to judge the effects of the use of this series of films in the classroom. It was established that their use increased the pupils' knowledge of places, personages, and events from 19 to 35 percent; most important, it stimulated 40 percent more free reading by pupils who had seen and studied the film series.

During this same period, the NEA became interested in exploring the usefulness of the silent film in instruction. In 1922, a Committee on Visual Education drew up plans which resulted in the production of the Eastman series of silent films in science and social studies. These early Eastman films were likewise the subject of a research experiment which concluded that over 60 percent of the pupils who saw and studied them achieved a level of proficiency attained by only 50 percent of pupils who did not see them. Again, there was greater interest in voluntary reading among the first group of pupils.

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[1] Yale University Press Film Service, New Haven, 1922.

These early experiments heightened the interest of educators everywhere. The addition of sound to silent film in 1929–1930 brought in the era of the educational sound motion-picture film. Since then, the production of educational sound films has advanced steadily, in both quality and quantity.

Of the many manifestations of 20th-century genius, the 16mm. sound film is one of the greatest. The motion-picture camera records what it sees; the sound track carries a record of what is heard. Thus, two of man's primary avenues of awareness—seeing and hearing—can be appealed to simultaneously. The sound motion-picture film is an almost living document of our social world and the world of nature.

PHYSICAL DESCRIPTION

Any description of a sound motion picture must be approached by describing (1) the photographics and (2) the sound electronics of a device that in reality is many inventions.

A motion picture is a series of still pictures taken in rapid succession, developed, and finally projected again as a series of still pictures but under such conditions as to give the viewer an illusion of motion. The addition of a coordinated sound signal or track results in a sound motion picture.

This needs to be elaborated. It can be done by describing how a portion of a single scene from the motion picture *Daniel Boone* (Sound, B&W, 16 min., EBF) was made. The section of the film which will be described appears in the shooting script as follows:

Sequence B—NORTH CAROLINA

10. *Field, forest and sky* (*3–80*)
    NARRATOR: Here the land was cheap and bountiful, and the symbol of a man's ownership was a
11. *Tree being notched* (*3–38*)
    gash in a tree . . . The Tomahaute Claim!
12. *Daniel Boone shooting* (*7–90*)

After a script has been written, it is usually reviewed and checked by a subject-matter expert. In this case both a recognized historian and a museum curator checked the ideas and descriptions in the script.

Next the action called for in the script was rehearsed. Studio light experts arranged the lights so as to focus attention on the smoldering wick that ignited the exposed powder when Boone wanted to discharge the long rifle at a target.

THE PICTURE TRACK

The motion-picture camera, actually a device for recording a series of still pictures at 24 exposures per second, was then set into operation. The result is shown in Fig. 13.3. Note how only slight changes in Boone's position appear from one still picture, or motion-picture "frame," to the next. This happens because the motion-picture camera rapidly "snaps" 24 still pictures or frames per second (16 frames for silent motion pictures). When these "still frames" are projected or flashed in sequence on a screen, the impression of life and motion is apparent to the viewer.

After the film has been developed, it is run through a motion-picture projector. This projector controls the direction of light so that light is projected through the series of frames onto a screen.

The projector diagram in Fig. 13.4 shows how 24 separately projected still pictures are flashed onto a screen each second. Each frame has a slightly different picture than the preceding one. A revolving shutter excludes the light during the time required for one frame to move out of the light beam and the next frame to move into it. Thus the screen is devoid of light for brief periods between projected still pictures.

The human eye is so organized that the image it

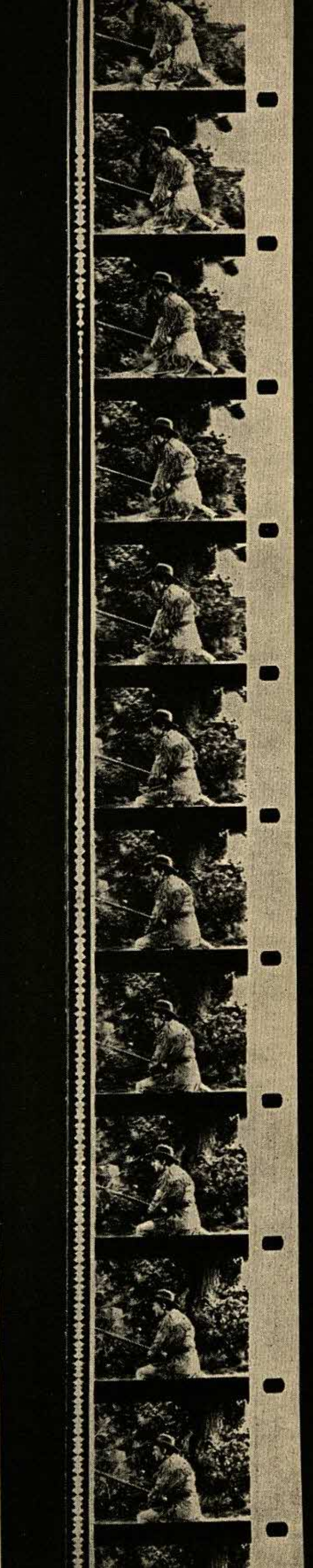

Fig. 13.3. It took Boone half a second to drop to a kneeling position as he prepared to shoot. How can you tell?

For this sequence the camera recorded 12 still pictures of the action at the rate of 24 exposures per second. As these "stills" are projected on the screen, note Boone's changing position frame by frame. Why is this?

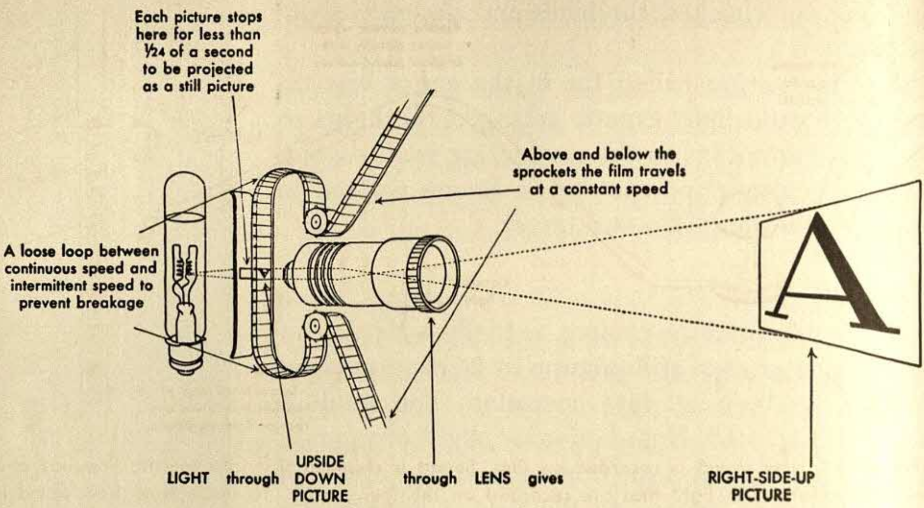
Each picture stops here for less than 1/24 of a second to be projected as a still picture
Above and below the sprockets the film travels at a constant speed
A loose loop between continuous speed and intermittent speed to prevent breakage
LIGHT through
UPSIDE DOWN PICTURE
through LENS gives
RIGHT-SIDE-UP PICTURE
A

Fig. 13.4. How the impression of motion is created by the projector.

sees persists in the mind for a brief time after the source of the impression, the actual stimulus, has disappeared. Because the normal eye is not constructed to detect these brief lightless intervals of less than 1/50 of a second, but is rather influenced by the persistence of the image, the mind gains the impression that the screen is continuously lighted. Since the eye cannot detect when one picture is replaced by the next, a visual-mental impression of motion is received in the brain. Thus, *the illusion of motion arises from what in reality is a rapidly changing sequence of still pictures.*

The ability of the eye and brain to carry a delayed impression of a visual image for a very small fraction of a second is called persistence of retinal impression. This characteristic is present in varying degrees in people. It is this quality which has made possible today's motion-picture industry, both entertainment and instructional.

THE SOUND TRACK

The discovery of the photoelectric cell made sound recording on film possible. The first sound pictures represented a combination of sound recorded on phonograph disks that were later synchronized with the film. In 1928 the recording and reproduction of sound on film became a reality.[2]

Sound is photographed on photographic film. The two photographic negatives, picture and sound, are then printed on one positive by ordinary photographic processes. The resulting film, when run through a modern

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[2] See *Sound Recording and Reproduction* (Sound, B&W, 10 min., EBF) for a detailed explanation.

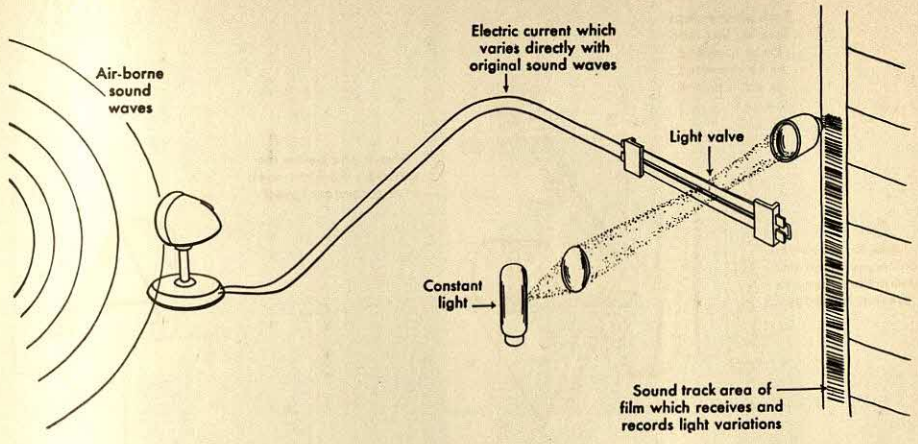

Electric current which varies directly with original sound waves
Air-borne sound waves
Light valve
Constant light
Sound track area of film which receives and records light variations

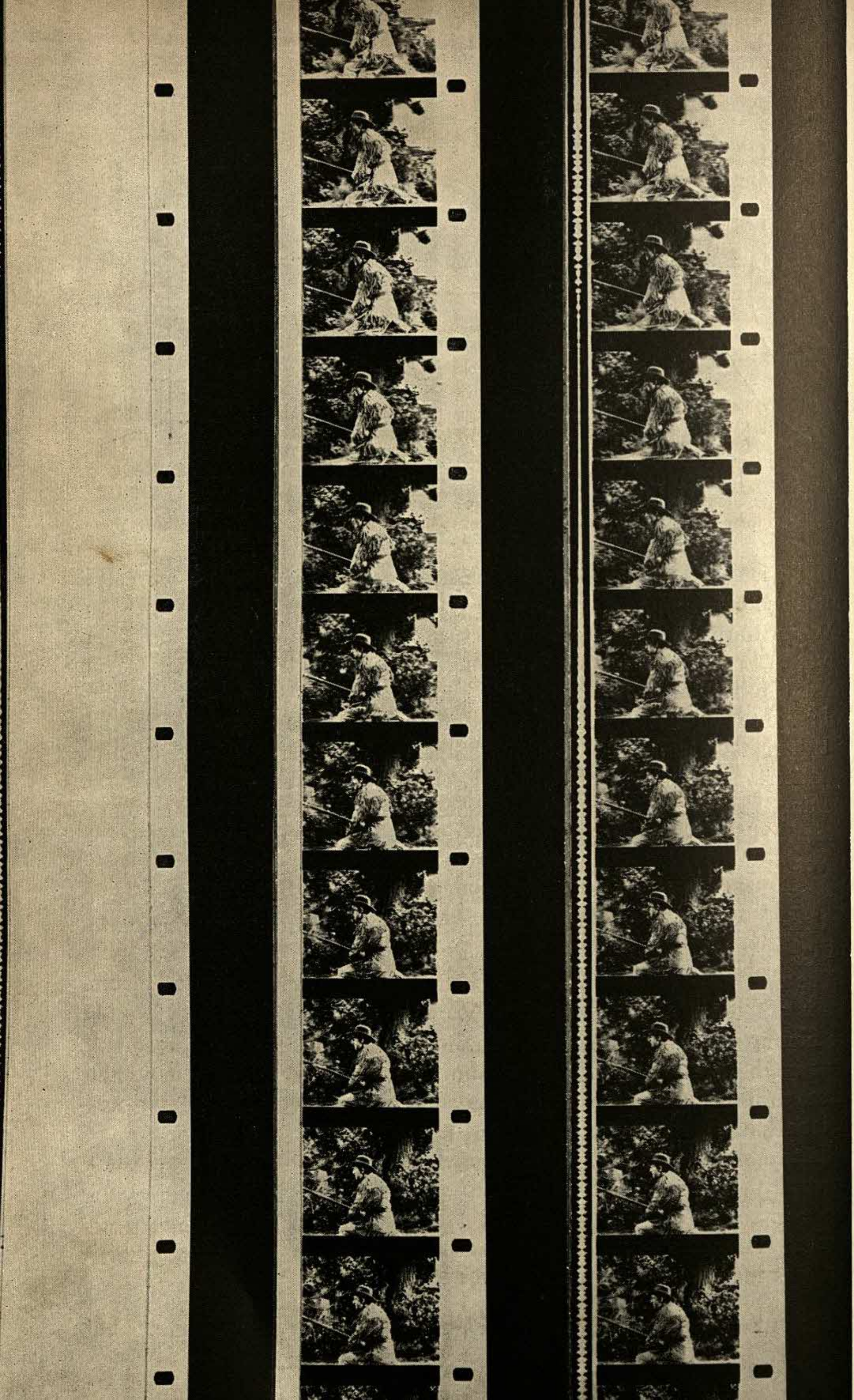
Fig. 13.5. How sound is recorded on film. Sound is changed first into electric impulses and then into variations in light that are recorded on the sound track. To understand how sound is reproduced later, see Fig. 13.7.

sound projector, gives rise to the visual-aural impression that we call a sound motion picture.

When the sound for a motion-picture film is photographed, the sound waves are picked up by a microphone which converts the varying sound waves into similarly varying electric current. These current variations control a light valve. The light valve used in most sound recording is composed of two metallic ribbons which move apart or together in response to the variations in current. A constant beam of light is focused on this valve. The opening and closing of the valve allows similar light variations to be recorded as light and dark areas on photographic film. The sound-image film moves at a speed of 24 frames per second, the same speed at which the photographic film moves. The process is summarized in Fig. 13.5. The sound motion-picture film for the sequence, rifle action—Daniel Boone, is shown in Fig. 13.6.

The means by which sound is reproduced from a sound motion-picture film is practically the reverse of the way it is recorded (see Fig. 13.7). As the film moves through the sound motion-picture projector, a light of constant intensity is directed through the sound track on the film. The light passes through the track in lesser or greater amounts depending on the light variations in the sound track.

This residual variable light is directed toward a photoelectric cell which converts the variable intensities into similarly varying electric currents. These in turn set up corresponding movements in the loud-speaker diaphragm. Thus, the original sounds recorded when the sound track of the film was made are once again reproduced.



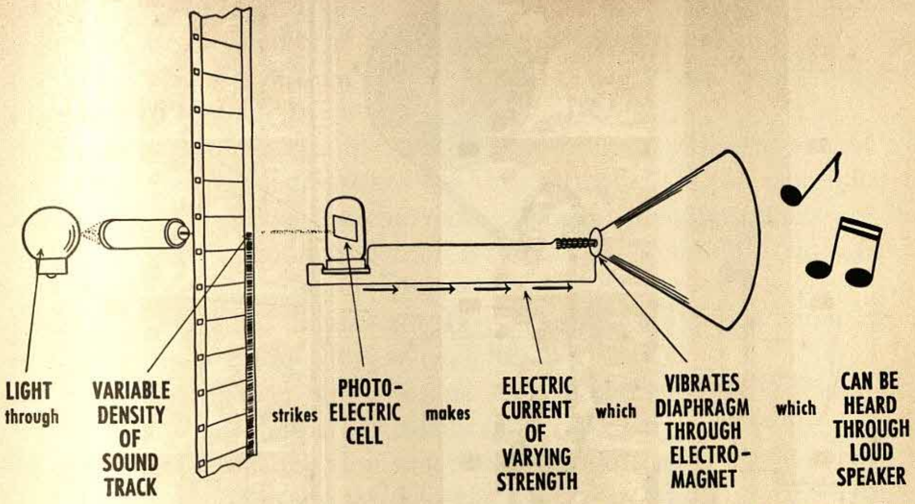

LIGHT
through
VARIABLE DENSITY OF SOUND TRACK
strikes
PHOTO-ELECTRIC CELL
makes
ELECTRIC CURRENT OF VARYING STRENGTH
which
VIBRATES DIAPHRAGM THROUGH ELECTRO-MAGNET
which
CAN BE HEARD THROUGH LOUD SPEAKER

Fig. 13.7. How the sound projector reproduces sound. Note that this reverses the process shown in Fig. 13.5.

THE SOUND MOTION-PICTURE PROJECTOR

The mechanism used to project sound motion-picture films is called a sound motion-picture projector. Although several types and makes of sound motion-picture projectors are available for school use, there have been developed during recent years several projectors with characteristics that specifically adapt them for classroom use. Such projectors are, first of all, light in weight for easy carrying, or they may be mounted on rolling projection stands so that they can be moved easily from classroom to classroom. Good sound systems and light sources in projectors allow motion pictures to be projected effectively in any classroom in which the light can be controlled by blinds, shades, or drapes.

Basically, *all* sound motion-picture projectors are a combination of three mechanical devices, each of which performs one of the functions which together constitute the modern projector:

1. A mechanism for passing light through a series of rapidly changed still photographs recorded on film. To do this, the projector must move the film in front of a strong light source, and it must mechanically start and stop this film 24 times per second in front of this light.
2. A mechanism for moving the sound-track portion of the film between a

Fig. 13.6. *Left:* The sound record is printed on one film. *Center:* The picture record is printed on another film. *Right:* The sound and picture records are finally printed on one film to produce the sound motion-picture film. Note the relationship of the sound track to the frames.

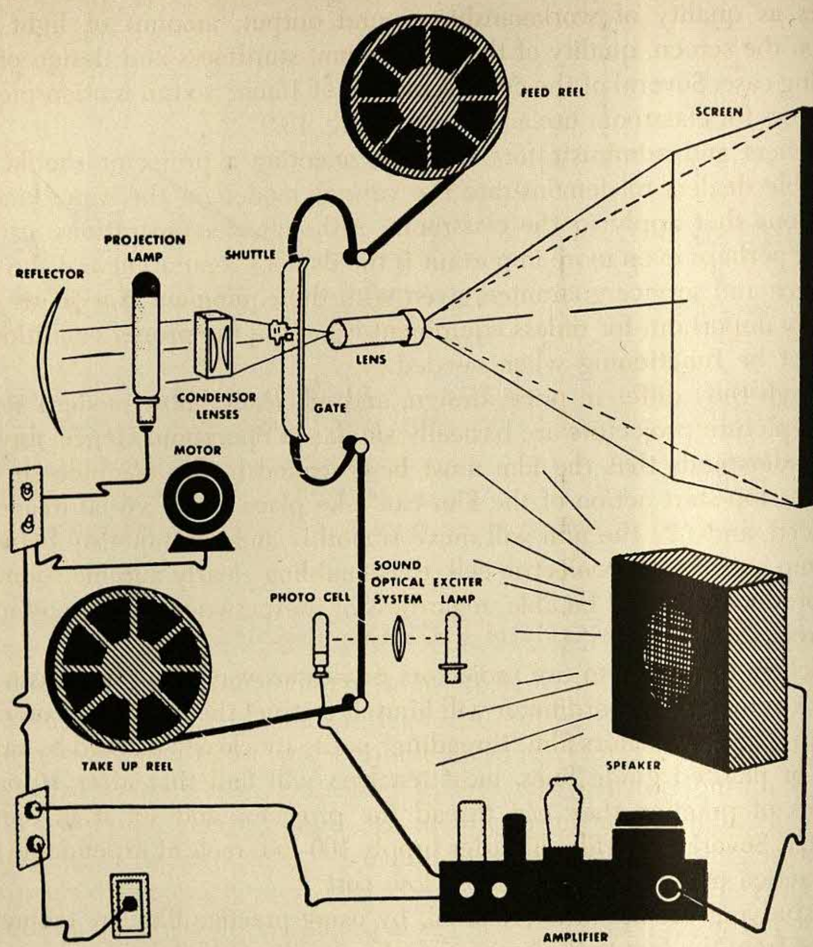


Fig. 13.8. This stylized diagram shows the three basic mechanical devices present in any of the several 16mm. sound motion-picture projectors now used.

constant light source and a photoelectric cell in order to reproduce sound. The film must move at a constant speed so as to produce lifelike sound.

3. An amplification unit much like a small radio set which will amplify a tiny sound impulse to a degree of loudness that allows the listener to hear lifelike voices and sound.

These three mechanical functions are present in all classroom sound motion-picture projectors in use today. A composite projector, a stylized version of any or all of the projectors currently in use, is shown in Fig. 13.8.

The several manufacturers of sound projectors emphasize various characteristics and elements of design. Differences in price exist because of such factors as quality of workmanship, sound output, amount of light that falls on the screen, quality of the lens system, sturdiness and design of the carrying case. Several of the current models of 16mm. sound motion-picture projectors for classroom use are shown in Fig. 13.9.

Teachers and administrators who are selecting a projector should ask reputable dealers to demonstrate the various models in the same kind of conditions that apply in the classroom. Although demonstrations are desirable, perhaps even more important is the dealer's reputation and the performance and service guarantee given with the equipment. Service is particularly important, for unless equipment is kept in the proper condition, it may not be functioning when needed.

Though they differ in price, design, and efficiency, most modern sound motion-picture projectors are basically similar in operation. Hence, anyone who understands that the film must be threaded in the machine so that (1) the stop-start action of the film can take place and a visual image be produced, and (2) the film will move smoothly and continuously between the lamp and the photoelectric cell, thus enabling clearly audible sound to be reproduced, should be able, regardless of inexperience, to use any modern projector.[3]

Teachers can learn to use projectors in various ways. In some cases the school's audiovisual coordinator will himself instruct them. Because on most modern sound projectors film "threading" paths are clearly marked by raised metal or painted guide lines, most teachers will find that after 10 or 20 minutes of practice they can thread the projector and set it in motion properly. Several state film libraries supply 100-foot reels of expendable film for practice purposes at extremely low cost.

By studying the operation manual, by using practice film, by taking assurance from the fact that women operate complicated kitchen and laundry equipment without difficulty, teachers—particularly women teachers—should have little trouble in learning to use this supplement to good teaching.

THE SOUND MOTION-PICTURE FILM IN INSTRUCTION

We now discuss the film, not as a physical and mechanical object but as a teaching-learning material for instructional use.

The instructional sound motion-picture film is a means of recording the social and natural environment of man so that it may be later reproduced to create realistic, lifelike learning situations which closely simulate the original.

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[3] For diagrammatic instructions in 16mm. sound projection, see Phillip Mannino, *ABC's of Visual Aids and Projectionist's Manual*, State College, Pa., rev. ed., 1959.

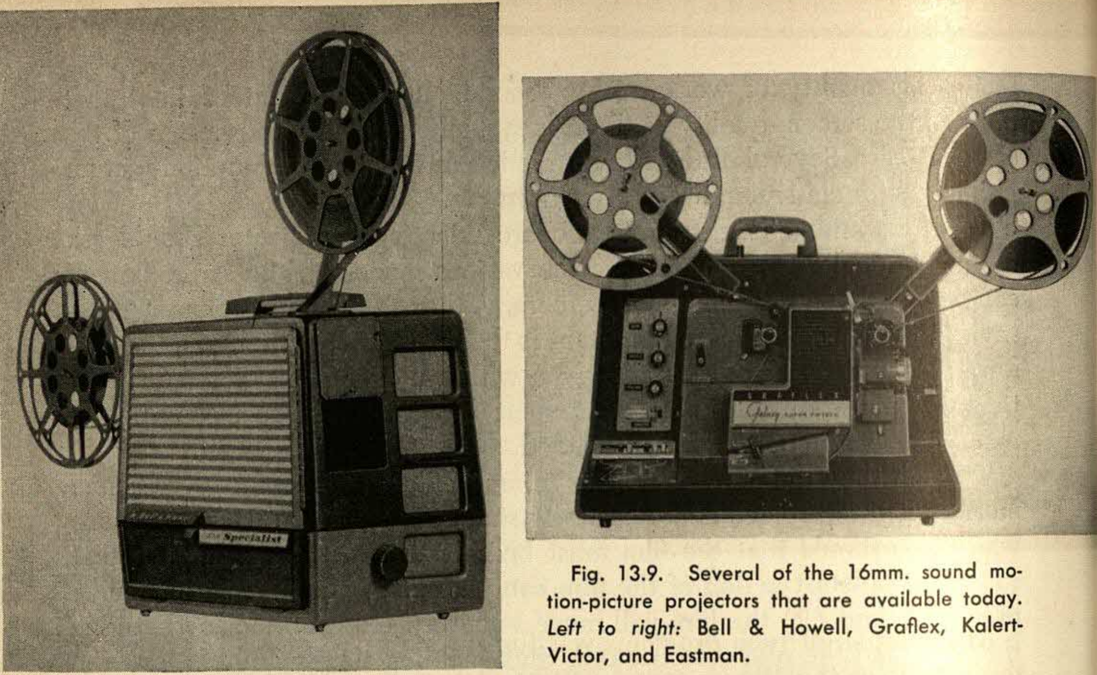


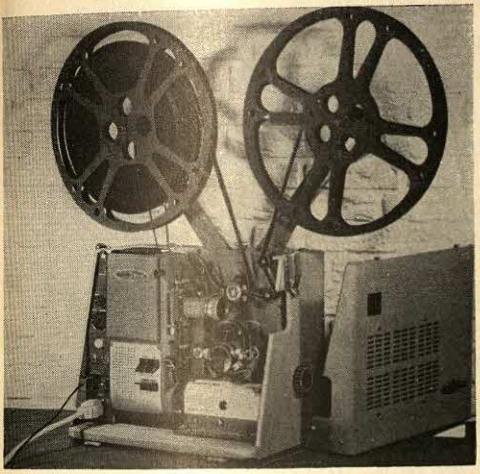
Fig. 13.9. Several of the 16mm. sound motion-picture projectors that are available today. *Left to right:* Bell & Howell, Graflex, Kalert-Victor, and Eastman.

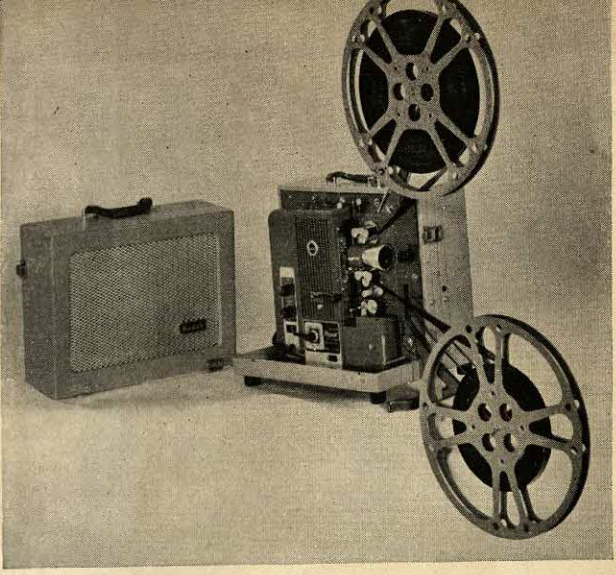
The effective teaching film allows the learner a maximum of personal identification with the situation recorded in sound and motion. The experience it re-creates may be only slightly removed from actual firsthand observation or participation. Such a film is a means of re-creating the environments of the world for conscious learning by the pupil.

DIRECT PHOTOGRAPHY

The recording "eye" of the camera and the "ear" of the microphone may be used in many ways in making teaching films. When the camera records things as you and I ordinarily see and hear them, a direct photographic sound record is the result. Many motion-picture films useful in teaching social studies, science, and language arts are direct photo-sound records. Such motion-picture teaching films open up major avenues of information in areas where for generations the means of information has been the textbook, the spoken word, the diagram, the picture.

The teacher who attempts to help children learn about faraway places soon realizes that a child who has spent his entire life in the metropolitan area of Philadelphia or the semiarid valleys of the Palomar Range in southern California has very little background experience to apply in studying a distant region unlike his own community. His experience will be of little help when he tries to interpret words which describe the homes, the witch doctors, the crafts, and the food-getting habits of the Mangbetu of the Congo basin.





Any solution of such problems was for the most part beyond reach until the advent of the 16mm. sound motion-picture film. Films which rely on direct photography—films which visually record places, things, constumes, speech, the sounds of animals—can make dramatic contributions to the learning process. Such films present real and understandable impressions that provide readiness opportunities for text and source reading.

The value of the direct photography sound motion-picture film is dramatically revealed in the field of history. Thirty years ago, students of American history examined wall charts containing crosses, dotted lines, and other symbols, and they read about battles, treks, and hardships. Their textbook had portraits of historic figures, black-and-white steel engravings of Old World architecture, and a woodcut or two of sailing vessels. The pupils listened to descriptions of historical events given by their teacher, who had learned about these incidents largely through the same medium —books. Neither teacher nor pupil had ever "witnessed" any of these episodes.

The 16mm. sound motion-picture film makes it possible to reconstruct the circumstances of history. Homes, castles, farms can be rebuilt; museums can supply costumes, utensils, and other authentic paraphernalia. Through research, the patterns of speech and pronunciation can be reconstructed. Finally, the carefully planned reenactment of historical events that have present-day social significance can be photographed by skillful cameramen. Thus we can relive history—understand the mode of living of those who first came to New England, "relive" the harshness of the first winter experienced by members of the new Naumkeag Colony (*Early Settlers of New England,* Sound, B&W, 11 min., and *The Pilgrims,* Sound, B&W, 22 min.,

both EBF), go down the Ohio River on a flatboat (*Flatboatmen of the Frontier*, Sound, B&W, 10 min., EBF) or cross the western plains (*Pony Express*, Sound, B&W, 10 min., Barr).

Direct photography provides a high-fidelity visual opportunity to witness scientific phenomena that are ordinarily inaccessible. The camera can record the fauna and flora that live in the heart of swamps (*World in a Marsh*, Sound, Color, 22 min., McGraw-Hill; *Singing Frogs and Toads*, Sound, Color, 11 min., International Film Bureau).

The story of people, places, and events is brought to the learner through direct photographic records, such as the *Geography of South America* series (Coronet), the *Your World Neighbors* series and the *Earth and Its People* series (United World), and *This World of Ours* series (EBF). Many recent films in geography have both English and foreign-language sound tracks. (See Fig. 13.10.)

CHANGING-SPEED PHOTOGRAPHY

Some things occur too quickly or too slowly to be readily apparent to the human eye or ear. In such cases the camera can be slowed down or speeded up, the resulting film being projected at normal speed.

Fig. 13.10. In what ways do these films showing the Oregon trail, an Indonesian boy, and gravity overcome barriers to learning such as time and distance?

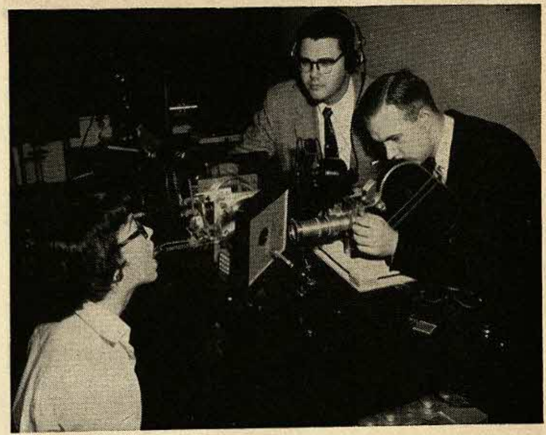


Fig. 13.11. When action, i.e., the vibration of the vocal folds, is so rapid that the human eye cannot observe it, how can a high-speed camera like this be used to compensate for the situation?

High-speed cameras can be used to explain things which occur too rapidly to be grasped clearly by our eyes (Fig. 13.11). Many of us have seen a sundew, a plant with curious traplike leaves that snare insect victims with amazing speed. High-speed cameras, however, can take pictures of this plant in action, at the rate of 240 or more separate pictures per second. When these pictures are projected at the usual rate—24 frames per second—the action that originally took place in one second (24 frames) will last for 10 seconds as the 240 frames flash across the screen. Now the eye has time to observe and the brain to comprehend how insects trip the delicate mechanism of the plant trap and become hopelessly snared for later digestion.

The reverse of this occurs when a camera records movement that is so slow that little or none of it is apparent to us. In the film *Flower at Work* (2nd Edition, Sound, Color, 10 min., EBF), single still pictures of a growing plant were taken at intervals of several minutes. In this way the plant's development over hours and days was recorded on photographs on which, when they were projected at the rate of 24 per second, months of plant growth were condensed into 10 minutes of viewing time.

Science teachers particularly need changing-speed motion-picture films. The life cycle of a butterfly extends over too much time, some chemical changes occur too rapidly, the process of crystallization is too slow for practical classroom observation. In these situations changing-speed films are valuable supplements to instruction in science, home economics, etc. Such films as *Seeds in Germination* (Sound, Color, 27 min., McGraw-Hill), *Sensitivity of Plants* (Sound, B&W, 14 min., UFA), *Succession from Sand Dune to Forest* (Sound, Color, 17 min., EBF), and *Mystery of Time* (Sound, Color, 40 min., Moody Institute of Science) should be previewed to appreciate fully the value of changing-speed photography.

PHOTOMICROGRAPHY

The use of the motion-picture camera to photograph anything that can be seen has been mentioned. However, the teacher of science, home eco-

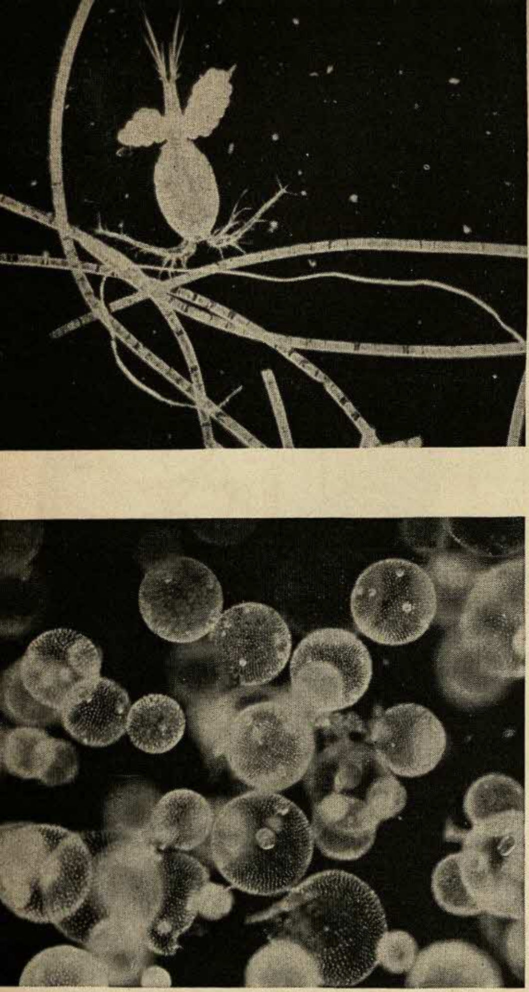


Fig. 13.12. Examine these photomicrographs and estimate the learning value of the detail which you can see. What learning advantages are offered by such a film as *Microscopic Life: The World of the Invisible?* *Top:* Cyclops with eggs. *Lower:* colony of Volvox.

nomics, or agriculture is often interested in seeing *beyond the limits of human vision.*

One way of seeing things too small for our eyes to observe is to use an enlarging lens or a microscope. Today the camera and the microscope can be combined to record by motion photography things that are too small for us to see. This process is usually called photomicrography or microphotography.

The home economics teacher who wants his pupils to understand how a house fly spreads disease and contaminates foods can produce photomicrographic proof of this by showing *The House Fly* (2nd Edition, Sound, Color, 15 min., EBF).

Great areas of subject content in the sciences are explained clearly and very interestingly by means of photomicrography. Thus the processes of life's creative force as cells of an embryo divide and redivide can actually be seen in *Reproductive System* (Sound, Color, 14 min., Coronet) and *Biography of the Unborn* (Sound, B&W, 17 min., EBF). So also, living and moving life processes in organisms that are too small to be seen by the human eye are shown in *Micro Life* (Sound, Color, 13½ min., United World), in *What Is a Cell* (Sound, Color, 27 min., McGraw-Hill), and in *Story of the Blood Stream* (Sound, Color, Part 1—29 min., Part 2—24 min., Moody Institute of Science). Young children can gain an understanding of the "unseen" world of microorganisms when such films as *World of Little Things* (Sound, Color, 15 min., Moody Institute of Science) and *The Honey Bee* (Sound, B&W, 11 min., EBF) are shown to a class.

Thus teacher and pupils can see beyond the former boundaries of human

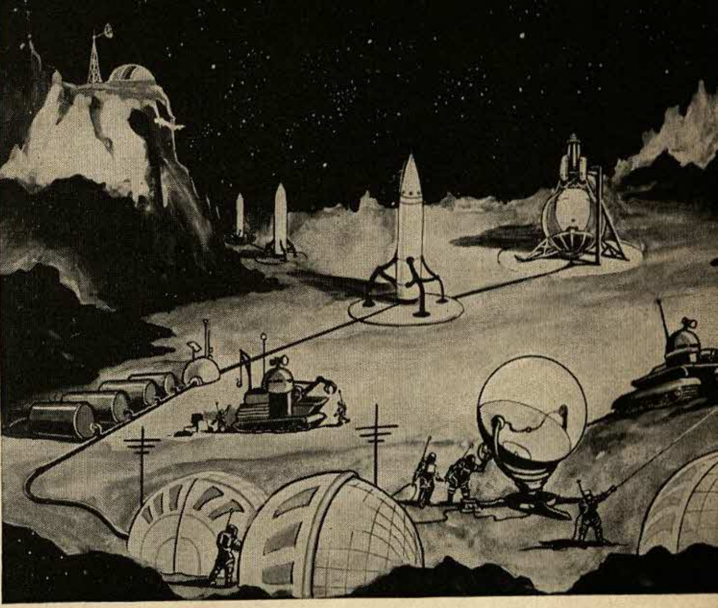
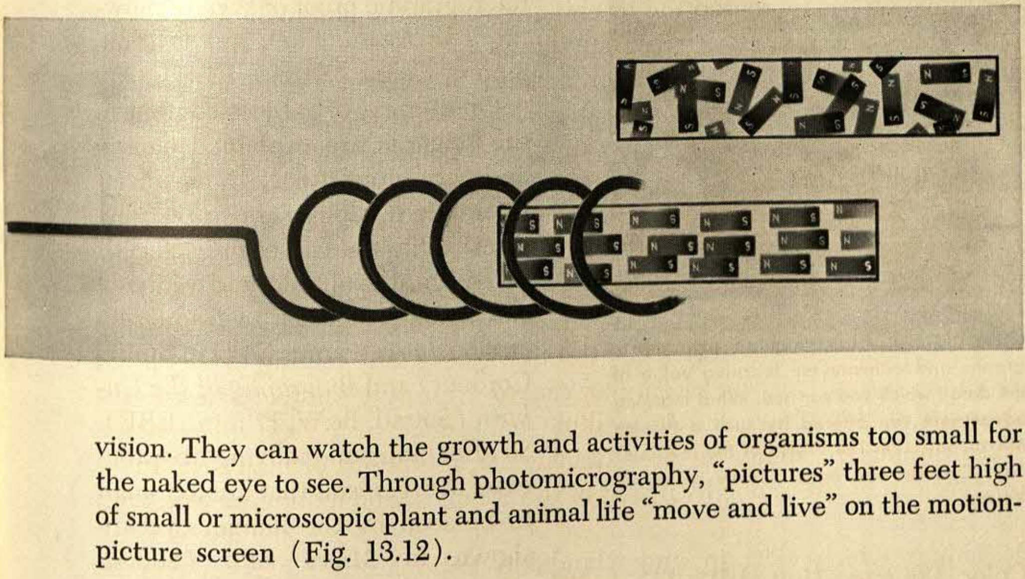


Fig. 13.13. A scene from *Way Stations in Space* and from *The Force of Magnetism,* in which animation is used to visualize ideas as such.



vision. They can watch the growth and activities of organisms too small for the naked eye to see. Through photomicrography, "pictures" three feet high of small or microscopic plant and animal life "move and live" on the motion-picture screen (Fig. 13.12).

ANIMATION

A teacher often encounters learning problems that demand information beyond what can be observed in real life. Learners are interested in investigating ideas which do not exist in concrete form. Although much of the curriculum is concerned with the physical, concrete aspects of the environment, there are broad fields of information apart from the real and tangible.

If motion and sound are effective in explaining tangible, real things, visualization should be even more effective in explaining theories, ideas, and hypotheses. Animation photography serves this latter area of learning.

Animation is the process by which a concept is visualized. The process is usually used to visualize a "hard to explain" concept. Abstract ideas can often be made concrete through analogy.

Today the need for animation is increased as the new and very complex science concepts become part of the rapidly changing science curriculum. How can the topographical characteristics of the moon's hidden surface be better explained than through the carefully prepared animation of *A Trip to the Moon* (Sound, Color, 16 min., EBF)? To envision the structure, operation, and flight of rockets and satellites (Fig. 13.13), every major film producer has depended on animation.

In children's films, animation makes possible many imaginative story reenactments such as *The Three Bears* (Sound, Color, 13 min., Film Association) and *Caprocita Roja* (Sound, English or Spanish, Color, 13 min., Film Association).

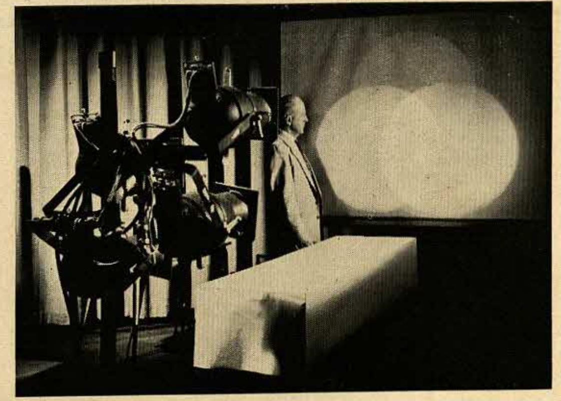
Animation has increased the teaching power of the film many times. The animated sound film can explain anything that exists in man's mind. There are few areas of human thought or learning today which are not well and effectively served by visual animation.

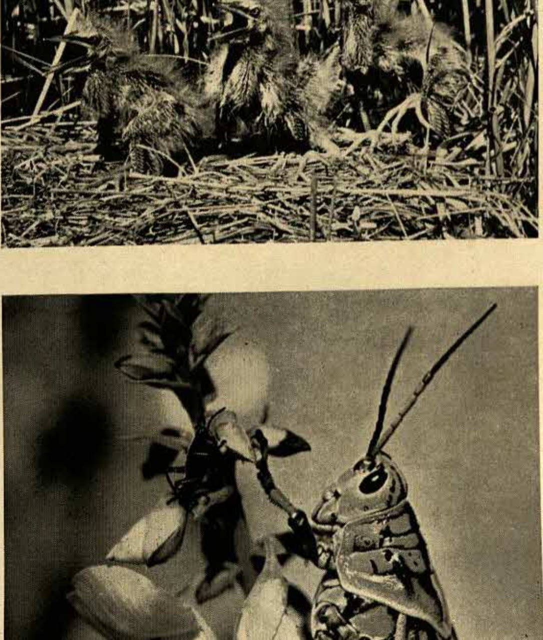
Splendid examples of film animation are provided by such films as *Jet Propulsion* (Sound, Color, 15 min., GE), *Fuels and Heat* (Sound, B&W, 11 min., EBF), *Work of Kidneys* (Sound, B&W, 11 min., EBF), *Biography of the Unborn* (Sound, B&W, 20 min., EBF), *Adventures of Junior Raindrop* (Sound, Color, 10 min., USDA).

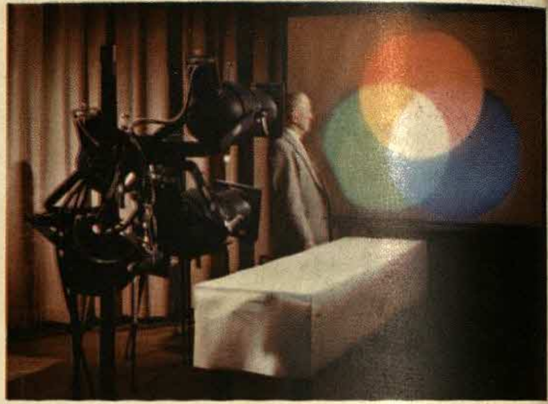
Previewing such films as the above will prove most helpful in gaining an understanding of animation. Only through seeing and hearing explanations given by sound motion-picture animation can full appreciation of the strength of this photographic medium be gained.

To summarize, many of the physiological limitations of man's ability to observe can be overcome by means of the 16mm. sound motion-picture film:

1. Things which exist in understandable but inaccessible form can be photographed from life by means of direct photography.
2. Things which are too small to be seen can be made visible by photomicrography.
3. Things which happen too rapidly for normal observation can be slowed down to comprehensible speed, and vice versa.
4. Things which are too abstract, too large, too hidden, or too theoretical for effective comprehension by the average learner can be visualized by animation and portrayed on film.







The 16 mm. sound motion-picture film can bring the entire world into the classrooms of the most remote mountain villages. No idea or phenomenon is too remote, inaccessible, or abstract for graphic and understandable explanation through this medium of communication.

COLOR

When should a colored 16mm. sound or silent motion-picture film be used in the classroom? Although often asked by teachers, this question is even more frequently asked by the people who are responsible for buying films and who are thoroughly aware of the wide differential in the price of a film that is released both in color and in black and white.

Colored motion-picture films should be used when the color enables the viewer to gain a more accurate, realistic, and vivid understanding of what is being shown.

Although the above sounds like a simple rule of thumb, it is difficult to remove from consideration of this principle the interest and enthusiasm in color *per se*. Such slogans as Hollywood's old "In gorgeous Technicolor" are not easily dismissed from the minds of movie-conditioned teachers and young people. However, in assessing the role of color in the selection and use of classroom teaching films, the single most important consideration should be whether it contributes to learning.

In the realm of nature, color and meaning are virtually synonymous. In nature, color has the function of attracting and in other cases of camouflaging or distracting. Hence to understand how color helps camouflage desert animals, such films must be shown in color, not in black and white. Colored films are equally important in describing the coloration of plants, birds, and animals. For aesthetic appreciation and accurate understanding of architecture and of the costumes of other social groups, particularly those that are remote in time or distance, color films, not black-and-white films, are necessary.

Although it is said that the average learner can "read" color into black-and-white pictures, this is not usually the case. When situations are too far removed for his firsthand experiencing of color, he probably will not have the opportunity for enough color experiencing to enable him to "color" the black-and-white pictures.

You can investigate the role and value of color by means of the plates facing these two pages. The first plate shows several black-and-white frames from current sound motion-picture teaching films. Examine these frames carefully and at length, and list mentally or in writing what you see in each one.

Now look at these same frames in color; it was from these that the black-

and-white frames were made. Examine the color frames carefully. Check your notes on each black-and-white picture. What additional information and, as important, aesthetic impression did you gain from the color frame? Then answer these questions:

1. What specific additional information was supplied through the color alone?
2. What relationship depended solely on color for meaning? (This is brought out particularly well in the frame showing the nymph and the mature grasshopper.)
3. What aesthetic feelings did you have after viewing the color frames which the black-and-white frames did not give you?

You are now as well prepared as anyone to assay the role of color in the sound motion-picture teaching film.

As important as the communication of facts is in the learning situation, do not overlook the role of color as a means of centering attention, inciting interest, and creating sheer aesthetic appreciation. Many educational film producers are convinced that if the economics of film production permitted the production of low-cost colored films, teachers would use only color films.

CLASSIFICATION OF 16MM. SOUND MOTION-PICTURE FILMS

Many classifications of motion-picture films have been made. Because the present discussion is concerned with the school use of sound films, films which are described here will be classified as (1) basic teaching films and (2) supplementary teaching films. (See Source Lists, pages 477 ff.)

Basic teaching films are usually made specifically for carefully designated curriculum areas. These films are planned and produced to improve teaching.

Supplementary teaching films are invariably made for some purpose other than enriching and implementing the school curriculum. Because most films have educational values, untold numbers of those made for extra-school purposes contain information which is of value in regular school learning situations.

Supplementary teaching films originate from many sources. They may be grouped into three classes: (1) documentary films, (2) sponsored films, and (3) entertainment films.

BASIC TEACHING FILMS

The producer of a teaching film is usually a student of school curricula. He is well aware of the values of a film in relation to instructional problems. He believes that when a subject demands visualization, motion, and natural or environmental sounds in order to be understood by the learner, the 16 mm. sound picture can make a contribution to both teacher and learner (Fig. 13.14).

A teaching film may be described in terms of several of its most inherent and valuable characteristics.

1. *It visualizes.*

Much of the material studied in school demands to be examined, manipulated, and seen in order to be understood. The effective teaching film completely and understandably visualizes its subject through good photography. It visualizes also through charts, diagrams, and animation if these techniques are needed for clear, understandable explanations.

2. *It employs motion.*

Things that move or in which action is an identifying characteristic make effective motion-picture subjects. A motion picture which explains the action of a jet engine will show the parts of the engine in action, if it is an effective film.

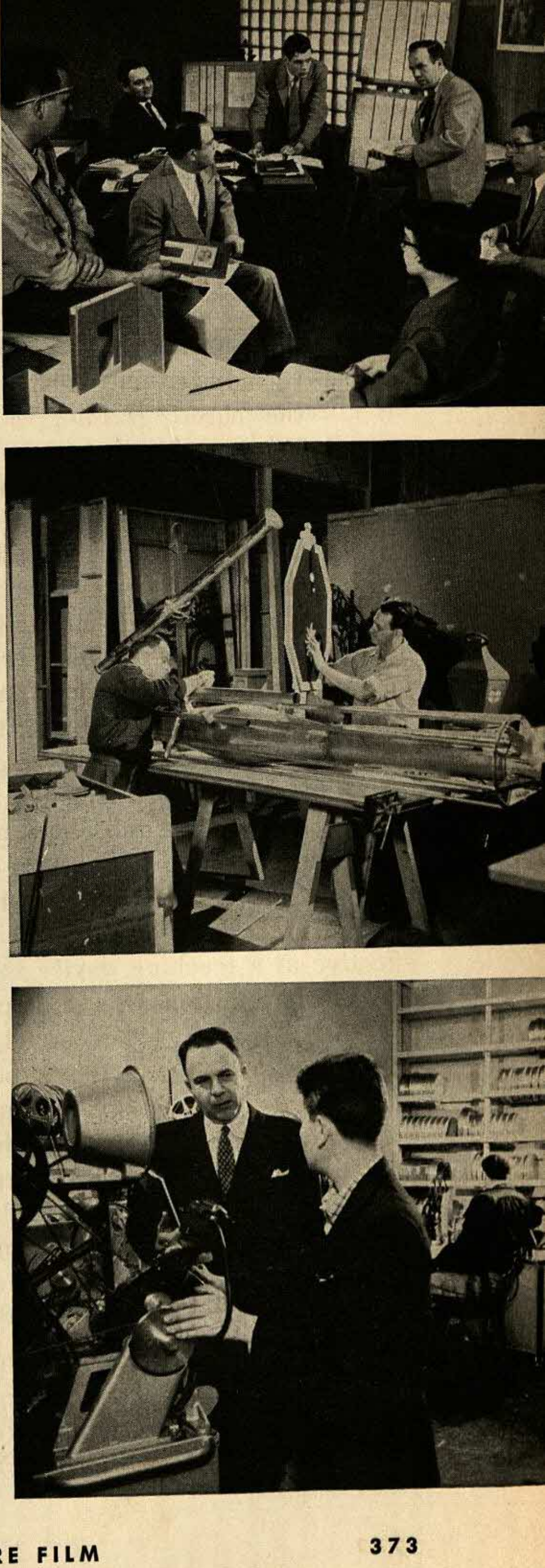


Fig. 13.14. An effective teaching film is the result of creative teamwork. Hours of research work (*top*) are followed by planning and photography (*middle*), and this in turn by accurate editing of pictures and sound.

A film that is merely a series of architectural views is not truly a motion-picture film. Such views are better presented on still pictures or slides.

Effective motion pictures portray things and processes by means of description, movement, and action.

3. *It includes environmental sounds.*

The effective teaching film records color, form, and action, but it also documents as much of the original environment as possible. Such sounds as the whir of machinery, the lapping of water, the characteristic noises of a railroad yard, the lowing of cattle, etc., add great realism to motion-picture visualization.

4. *It employs narration.*

Helpful explanatory narration accompanying motion photography is useful in directing the learner's attention and establishing his understanding of visualized relationships. Such narration is inherently related to the visual content; it is not merely a "lecture" that accompanies a photographic story.

5. *It employs color when it is useful.*

The effective teaching film records what actually exists. If color will assist in imparting understanding, comprehension, and aesthetic appreciation, then color is obviously desirable.

6. *It is related to the school curriculum.*

The teaching film is definitely related to the content and subject matter of the school curriculum. The film was made because it can provide understandable explanations by means of visualization and sound and thus make unique contributions to classroom learning.

Finally, the teaching film avoids the curriculum areas where it is less effective as a teaching device than other means of presentation.

A teaching film has been described as follows:

> The "educational sound film" implies the following points . . . (1) The sound film should include environmental and interpretive sounds appropriate to the action so as to make the content of the film more realistic. (2) The visual concepts included should be those which ordinarily cannot be interpreted to the student in the classroom. (3) The sound film should interpret, by a blending of the foregoing two factors, such audio-visual concepts as will stimulate the learner's eye and ear and make it possible for him to become aware of the whole situation portrayed just as if he were actually there at the scene of action observing a segment of life in all its completeness.[4]

Today teaching films are being produced in virtually all curriculum areas. The best way to become acquainted with these films is to preview them. Collections of educational films are available in all state universities, in most public and private colleges, particularly those with courses leading to teaching certificates, and in audiovisual centers in hundreds of city schools. Evidence of the increase in the number of educational film library collections is found in the U.S. Office of Education Film Library Directory. In 1950, it listed 2001 educational film libraries in the United States, as against over 3660 listed in the 1959 directory. Consult this directory for films available in your locality.

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[4] Walter Arno Wittich and John Guy Fowlkes, *Audio-Visual Paths to Learning*, Harper, New York, 1946, p. 29.

The producer of a teaching film is realistic in recognizing that if a film does no more than a good teacher can do with the instructional materials already in use, he had better turn his creative efforts elsewhere.

Fortunately the high cost of production makes it necessary to consider very carefully all the foregoing characteristics. Teachers are becoming more and more aware of the true contribution of the teaching film in improving instruction. The general level of effectiveness of these films is on the upswing. These two factors work to the advantage of the school and promise increasing numbers of high-quality teaching films.

SUPPLEMENTARY TEACHING FILMS

The 16mm. teaching film is such an effective medium of communication that industrial groups, government agencies, and other special groups with a message are producers of motion-picture films.

Many of the films produced by these various agencies are offered to schools, for almost any film may be considered "educational" to some extent. The extent to which supplementary films are useful for classroom purposes varies. In order to help distinguish the sponsored films which make a contribution to teaching from those that do not, the main sources and types of supplementary teaching films will be described.

As was said earlier, most of these films can be classified as documentary, sponsored, or entertainment films.

The Documentary Film. John Grierson, Pare Lorentz, and Robert Flaherty were a few of the many men who were associated with a new and very expressive type of motion-picture film after World War II. Just as an artist chooses still life portraiture, or urban or rural life as his area of interpretation, these skillful motion photographers chose the drama of people and their association with the forces of society and nature as their assignment. They called their medium of expression the documentary film.

John Grierson is still best known for his motion camera impressions of the herring fishermen of England. Through his skill as author, observer, and sensitive cameraman, *Drifters* (Silent, B&W, 60 min., IFB) lifts the little-known life of the fishermen from its commonplace level to one of high drama.

R. H. Watt created an artistic, fast-moving, fascinating, and also truthful story in *Night Mail* (Sound, B&W, 22 min., IFB), which shows the English postal system in operation. It is an account of a night train that carries the mail. For all its truth in reporting, the viewer sits in admiration and awe as the speeding wheels carry the ghostlike train of cars through the darkness. Yet *Night Mail* is actually meant to show nothing more than a routine mail run.

Robert Flaherty has been recognized for his documentary film stories of primitive men and their struggle to make a home in the harsh environments in which they live. His films on Eskimo life, *Nanook of the North* (Silent, B&W, 90 min., Museum of Modern Art), and on the daily life of the South Sea Islanders, *Moana* (Silent, B&W, 105 min., Museum of Modern Art), are so beautiful and at the same time so factual that sociologists and anthropologists consider them source material.

His last production before his death was *Louisiana Story* (Sound, B&W, 77 min., Standard Oil), which describes the development of the swampland oil fields in Louisiana. The story of the Cajun boy who watches the quietness of his swampland home and hunting ground disrupted by the oncoming derrick barges is gripping, awesome, and moving, as revealed through Flaherty's camera interpretation.

The River (Sound, B&W, 31 min., USDA), which pictures the ravages of the flooding Mississippi River, is one of the most widely used documentary films in the schools today. In this well-known and outstanding example of a documentary film, Pare Lorentz, its maker, has described the medium itself. He uses no sets or professional actors, but records events as they occur in reality. Many implied questions are raised—Can we control floods? Should we reforest? Should contour farming be used?

The documentary photographer can now achieve even greater reality by making his film in color. The International Film Bureau has been remarkably successful in producing very human and complete color films that carefully document broad social areas of Canadian life. Films like the following, all produced by this organization, are valued supplements to the social studies: *People of the Potlatch* (Sound, Color, 22 min.), *Portage* (Sound, Color, 22 min.), and *Skeena River Trapline* (Sound, Color, 16 min.).

Another documentary, *Morning Star* (Sound, Color, 33 min., EBF), visualizes the watchful care of sheepherders as they take a large flock across a mountain range to their final goal, the summer pasture. The portrayal of the hazards they encounter and the way dogs, men, and sheep work together in overcoming them defies description.

The documentary film can be an extremely useful teaching instrument, particularly in the social studies area. Good documentary films can show students how people live, think, and act. The opportunity to do this, to make possible a realistic understanding of social problems by the student, is nearer fulfillment today because of these films. Although generally produced for adults, they can bring valuable and heretofore inaccessible learning experiences into the classroom. Since the way to understand these films is to see them, arrange with your building coordinator or audiovisual supervisor to preview as many of the following as possible:

And Now Miguel, Sound, B&W, 64 min., United World.
Angotee, Sound, Color, 32 min., International Film Bureau.
The City, Sound, B&W, 33 min., United World.
Louisiana Story, Sound, B&W, 77 min., Standard Oil.
Morning Star, Sound, Color, 33 min., EBF.
Night Mail, Sound, B&W, 22 min., BIS.
Portage, Sound, Color, 22 min., International Film Bureau.
Skeena River Trapline, Sound, Color, 16 min., International Film Bureau.

The Sponsored Film. Manufacturers, merchandisers, and distributors have been quick to detect the effectiveness of 16 mm. sound motion-picture films as a means of communication.

Literally hundreds of films are sponsored and produced each year by commercial firms for the purpose of telling the story of the manufacture and use of their products. Since the sponsored film is usually part of a broad advertising or informational program, it is generally organized so as to carry its message to the widest possible audience. Because the schools are sought as part of this audience and because more and more sponsored films are being produced each year, it is the responsibility of school people to understand this type of film, accept the films which contribute to classroom learning, and reject those that are of doubtful or no value.

Some educators feel that sponsored films are entirely acceptable in helping to meet the educational objectives of local school systems. Others refuse to use them on the ground that the school could become a captive audience for films which are biased in favor of a sponsor's point of view.

Since every film should be chosen in relation to the school curriculum, it is necessary to examine the sponsored film in terms of the present-day philosophy of the school curriculum.

As was brought out in an earlier chapter, there is growing insistence on the part of curriculum workers, parents, and teachers that community resources be used to the fullest. There is likewise insistence that the selection and use of films in the classroom should be based on instructional needs. As the school investigates the community, it soon discovers that those best able to explain the community are the people who make up the community.

Who is in a better position to explain telephone communication than the telephone company? Who is better qualified to describe the services of an international airline system than an airline company? Who is better qualified to describe how flax is grown by hand, harvested, and converted into linen than the Irish Linen Guild of the British Isles?

Of the many arguments against the use of sponsored films in the classroom, the foremost concerns the fact that the children will be easily impressed and influenced by a biased film presented in a situation in which they are used to accepting information as truthful and beyond question. If a sponsored film is biased or contains unwanted advertising propaganda, there is little doubt that the children will be influenced.

The responsibility here rests with the teacher. If a sponsored film contains information which can help create a desired learning situation, he should consider it for use. If not, he should reject it. Today many sponsored films tell their story simply and effectively, with none of the flagrant advertising which twenty years ago was characteristic of such films.

To understand sponsored films, you must preview them.[5] As you see the following films estimate their usefulness in terms of the foregoing discussion.

ABC of Hand Tools, Sound, B&W, 33 min., General Motors.
Alphabet Conspiracy, Sound, Color, 60 min., Bell Telephone.
Architecture USA, Sound, Color, 25 min., American Institute of Architects.
Automation in Air Traffic Control, Sound, Color, 11 min., Remington-Rand.
Building of a Tire, Sound, Color, 28 min., Firestone.
Census Sixty, Sound, B&W, 13 min., Remington-Rand.
Chemistry of Aluminum, Sound, Color, 22 min., Reynolds Metals.
Cotton: Nature's Wonder Fiber, Sound, Color, 27 min., National Cotton Council.
Gift of Green, Sound, Color, 18 min., Sugar Information, Inc.
Green Harvest, Sound, Color, 29 min., Weyerhaeuser.
Hemo the Magnificent, Sound, Color, 60 min., Bell Telephone.
Information Machine, Sound, Color, 11 min., IBM.
Jet Propulsion, Sound, Color, 15 min., GE.
Our Mr. Sun, Sound, Color, 60 min., Bell Telephone.
Rehearsal, Sound, B&W, 23 min., Bell Telephone.
Story of Leather Making, Sound, Color, 30 min., Fred Rueping Leather.

The Entertainment Film. Many great literary works have been made into motion pictures designed primarily for entertainment, and in many cases selected sequences from these films serve well as learning experiences. An association called Teaching Film Custodians (TFC) has as its purpose seek-

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[5] A complete list of sponsored films appears in *Educators' Guide to Free Films,* published annually by Educators Progress Service, Randolph, Wisconsin.

Fig. 13.15. How do you think showing such a film as Mark Twain's *Mississippi* might influence students' interest in reading books by that author?

ing the cooperation of professional education groups in selecting, shortening, and preparing entertainment films for classroom showing.

Recently, TFC and the National Council of the Teachers of English selected and edited sequences from such films as Mark Twain's *Mississippi* (Fig. 13.15). *The Devil's Disciple* and *The Doctor's Dilemma* were similarly excerpted from motion-picture versions of these two plays by George Bernard Shaw. The latter two are useful in high-school classes in the language arts.

Other TFC cooperative planning with professional education groups has resulted in such classroom film sequences as the following:

SOCIAL STUDIES

Due Process of Law Denied, Sound, B&W, 29 min.
Give Me Liberty, Sound, Color, 21 min.

Johnson and Reconstruction, Sound, B&W, 33 min.
Justice Under Law, Sound, B&W, 30 min.

English and Literature

Adventures of Huckleberry Finn, Sound, B&W, 38 min.
Christmas Carol, Sound, B&W, 37 min.
David Copperfield, The Boy, Sound, B&W, 42 min.
David Copperfield, The Man, Sound, B&W, 45 min.
Tale of Two Cities, Sound, B&W, 40 min.
Treasure Island, Sound, B&W, 38 min.

Music

Great Waltz, Sound, B&W, 20 min.
Inside Opera with Grace Moore, Sound, B&W, 28 min.
Naughty Marietta, Sound, B&W, 34 min.
Schumann Story, Sound, B&W, 30 min.

Health and Physiology

Man's Greatest Friend, Sound, B&W, 10 min.
One Against the World, Sound, B&W, 11 min.
Story of Dr. Jenner, Sound, B&W, 10 min.
Story of Louis Pasteur, Sound, B&W, 34 min.

An interesting current project of the TFC, although not strictly classified as entertainment films, is the preparation of newsreels with foreign-language narrations in cooperation with modern-language teachers. Newsreels have been examined, appropriate sequences excerpted, and narration supplied in French, Spanish, German, or Russian.

VALUE OF 16MM. SOUND FILMS

Ask the pupils who see films during their classes what they think of them, and there will be many positive responses.

Films can affect the whole climate of instruction. Careful selection and use of teaching films can result in positive changes in students' interest, learning efficiency, retention of learning, and reading performance; furthermore, films offer a natural path to learning.

INCREASED PUPIL INTEREST

A research study by Wittich and Fowlkes[6] reports reactions of school children to the use of films. Members of the intermediate grades were allowed to see carefully selected teaching films in science and the social studies. At first some of the children were not much interested in the use of films in work-study situations, but by the end of the school year the following changes in interest and attitude were evident:

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[6] Walter Arno Wittich and John Guy Fowlkes, *op. cit.* The following quotations in this section are from this title.

> Sound movies made it easier for me to understand about things. They don't use such big words as the geography book does.
>
> Seeing the films gave me new and different ideas.
>
> I learned from the films how countries really look, how people look. I got a better idea of what part of the world the country was at.
>
> I never knew how some of the people lived when I read in books and I didn't know what kind of clothes they wore or how they looked.
>
> It's fun and interesting because it tells what books don't tell. It makes it more plain to me. I can really see things.

In response to the question, "Do you like this way of learning?" such statements as the following were made by these students. Note the variations in these responses.

> Case 1—I.Q. 135; reading score 9.6.
>
> I liked the sound films because they are a new way of learning, and a movie gives more information than just reading. . . .
>
> Case 12—I.Q. 114; reading score 7.6.
>
> I like the sound films because I get more out of what I can really see. . . .
>
> Case 18—I.Q. 105; reading score 8.2.
>
> This way of learning shows the way things are done. It's easier to understand the subject. . . .
>
> Case 28—I.Q. 95; reading score 5.9.
>
> I like this way of learning because I get information that I would not be able to find in books. . . .
>
> Case 30—I.Q. 85; reading score 5.7.
>
> I like this way of learning because I can see all the details. . . . In books there are only words and I can't see much of a background. In films I can hear the people.

The fact that these pupils so consistently mention the clarity and understandability of films as learning devices leads to the observation that pupil interest is enhanced because the sound film is a realistic way of learning, like that used in out-of-school situations. We are conscious of our everyday environment because we observe it through sight, sound, and mind. A good teaching film is interesting because it presents information in a realistic manner. It is natural to learn by seeing and hearing.

INCREASED FACTUAL LEARNING

Early studies by Wood and Freeman,[7] Wise,[8] and Knowlton and Tilton[9] uniformly gave evidence to the effect that when carefully selected silent films were used with regular classroom study materials, advantages in learning resulted that were far beyond what was possible with more traditional instruction materials. These studies reflected the presound film period in the school use of films.

After the sound film was brought into the classroom in the 1930's, research was undertaken to discover if it was as successful as the silent film. The chart in Fig. 13.16 answers this question in the affirmative.

Rulon describes the results obtained from using several selected sound films with ninth-grade general science students: "In terms of immediate student achievement, our results indicated that the teaching technique employing the motion-picture film was 20.5 percent more effective from the instructional standpoint than was the usual unaided presentation."[10]

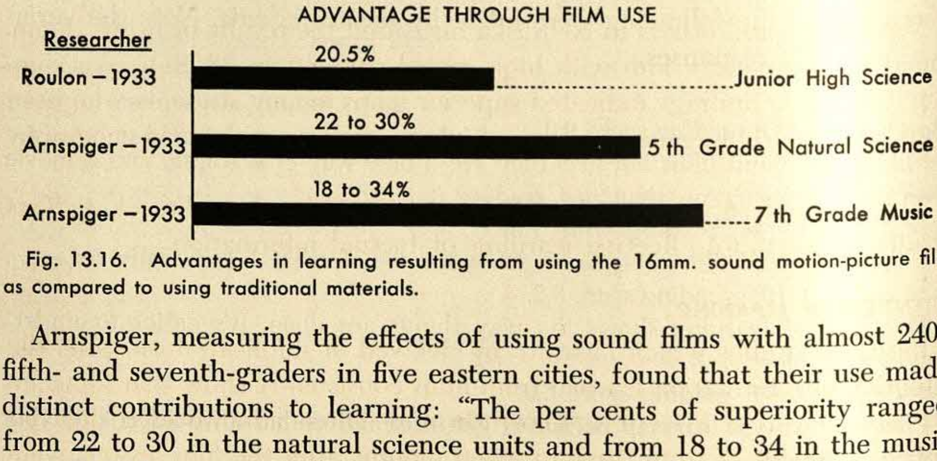

Fig. 13.16. Advantages in learning resulting from using the 16mm. sound motion-picture film as compared to using traditional materials.

Arnspiger, measuring the effects of using sound films with almost 2400 fifth- and seventh-graders in five eastern cities, found that their use made distinct contributions to learning: "The per cents of superiority ranged from 22 to 30 in the natural science units and from 18 to 34 in the music units."[11] Other researches conducted during these same years by Consitt, McClusky, and Weber, among others, showed similar results.[12]

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[7] Ben D. Wood and Frank N. Freeman, *Motion Pictures in the Classroom*, Houghton Mifflin, Boston, 1929.

[8] Harry A. Wise, *Motion Pictures as an Aid in Teaching American History*, Yale Univ. Press, New Haven, 1939.

[9] Daniel C. Knowlton and J. Warren Tilton, *Motion Pictures in History Teaching*, Yale Univ. Press, New Haven, 1929.

[10] Philip J. Rulon, *The Sound Motion Picture in Science Teaching*, Harvard Univ. Press, Cambridge, 1933, p. 98.

[11] Varney C. Arnspiger, *Measuring the Effectiveness of Sound Pictures as Teaching Aids*, Teachers College, Columbia Univ., New York, 1933, p. 83.

[12] Francis Consitt, *The Value of Films in History Teaching*, G. Bell Sons, London, 1931; Frederick K. McClusky, *An Experimental Comparison of Different Methods of Visual Instruction*, doctoral dissertation, Univ. of Chicago, 1922; J. J. Weber, *Comparative Effectiveness of Some Visual Aids in Seventh-Grade Instruction*. Educational Screen, Chicago, 1922.

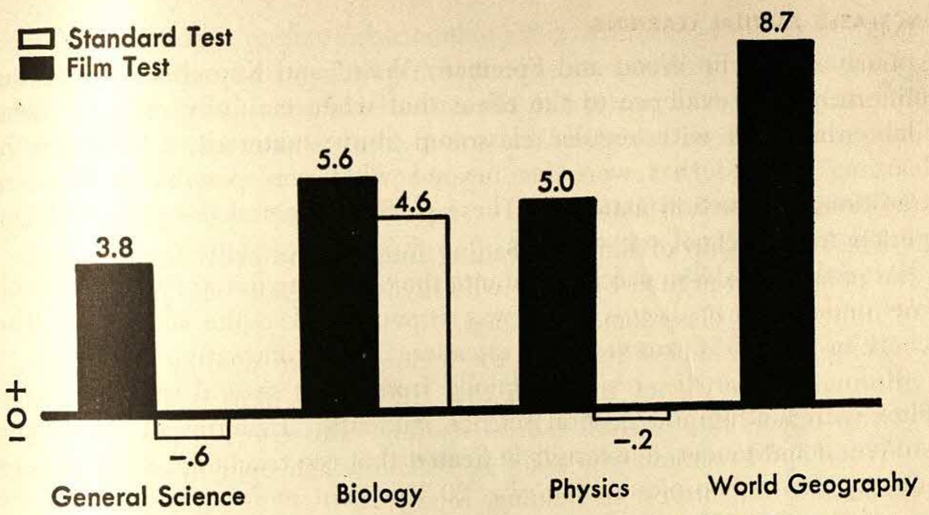

Fig. 13.17. High-school gains in learning through the use of motion pictures.

Meierhenry and others in Nebraska measured the results of using 16mm. sound motion-picture film with high-school students in 28 Nebraska communities.[13] The findings indicated superior gains among students who used films, particularly in general science, biology, physics, and world geography (Fig. 13.17).

Thus research supports the fact that using carefully selected teaching films results in the more effective learning of factual information.

RETENTION OF LEARNING

Research studies which measure by delayed or duplicate-form tests the retention of information learned from films consistently show that films are superior to verbal materials. Knowlton and Tilton administered delayed tests at intervals of from three to seven months after the film lessons were

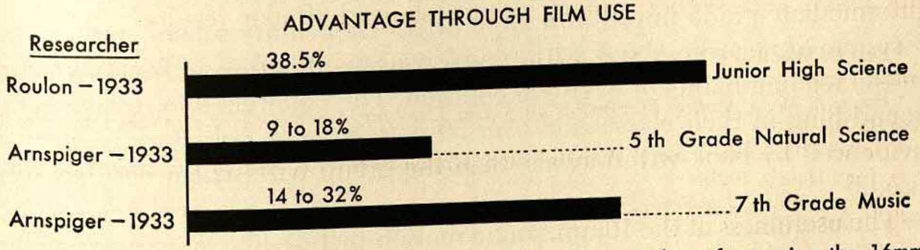

Fig. 13.18. Advantages in retention of learned information resulting from using the 16mm. sound motion-picture film as compared to using traditional materials.

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[13] Wesley C. Meierhenry, *Enriching the Curriculum Through Motion Pictures*, University of Nebraska Press, Lincoln, 1952.

completed. They found that films influenced retention as follows: About 12 percent more information was retained from film than from verbal learning; the increase was 14 percent in the case of historical geography.[14] The relationship between retention and sound films is shown in Fig. 13.18.

INCREASED READING INTEREST

The relationship of films to reading interest and skills has been one of the points most argued by those who favor and those who oppose the use of films in the classroom.

Some people believe firmly in the inviolability of reading as a source of information and hence maintain that the use of films in instruction adversely affects interest and skill in reading. This concern is unwarranted.

Wood and Freeman, who asked 93 teachers their opinion on the effect of silent films on interest in reading, report:

> Three fourths of the teachers believe that the films increase the quantity and quality of the children's reading. This opinion is confirmed by the report of the school librarians. In several cities administrative officers of the schools said that school librarians have reported that library facilities were not adequate to care for the increased library demands of the children involved in this experiment.

The teachers' own responses further confirm this reaction: "The quality of reading has been improved because the child has an intense desire to find out a definite thing. The study guide was an aid in organizing and judging the information found on the topic. The many contacts the picture gave increased the quantity of reading."[15]

According to Knowlton and Tilton, seeing silent films caused children "to read voluntarily more supplementary history material under controlled classroom conditions."

In a later attempt to check such information, the school librarian was asked to devise a means of checking the reading done voluntarily by the intermediate-grade pupils of a large urban elementary school, and in 1946 a system of recording book withdrawals was instituted which enabled study of the reading habits of over 300 children. The children who regularly saw sound films in their classes did over 50 percent more voluntary reading, as evidenced by book withdrawals, than the group with whom no films were used.[16]

The usefulness of the 16mm. sound motion-picture film in improving reading was measured in 1952–1953 by Paul Witty, James Fitzwater, and Harriet Gorman. Their study, which tested the influence of eight selected sound films on the reading ability of second-grade children, showed that 95 percent of the children improved in reading, 95 percent showed vocabulary improvement, 70 percent expressed more and better ideas during class discussion, and 99 percent wanted to continue the work with films. Teachers participating in the study confirmed these findings.[17]

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[14] Daniel C. Knowlton and J. Warren Tilton, *op. cit.*, p. 91.

[15] Ben D. Wood and Frank N. Freeman, *op. cit.*, pp. 153–154.

[16] Walter Arno Wittich, "Effects of Film Use in Reading Habits," unpublished study, 1946.

Thus research evidence establishes the fact that the regular use of teaching films produces in pupils the desire, interest, and readiness both for more reading and for more comprehensible reading.

THE FILM AND RELATED AUDIOVISUAL MATERIALS

In 1955 Louis Romano investigated the effect, among fifth-, sixth-, and seventh-grade pupils in the Shorewood, Wisconsin, Public Schools, of the 16mm. motion-picture film and related still pictures (both projected and nonprojected) on mastery of specific science vocabulary taken from reading materials.[18] His study is unique in that he chose as his subjects children who were already used to a learning environment that their teachers considered unusually enriched.

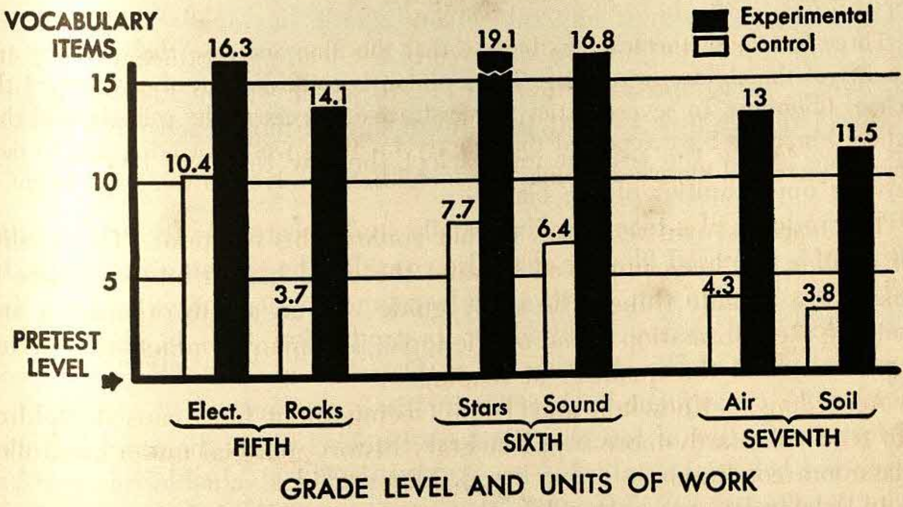

Fig. 13.19. Gains in science vocabulary, fifth through seventh grades, resulting from using selected sound motion pictures and related flat pictures.

Greater vocabulary gains were made by the film-using groups (Fig.

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[17] Paul A. Witty and James P. Fitzwater, "An Experiment with Films, Film-Readers, and the Magnetic Sound Track Projector," *Elementary English*, April, 1953, pp. 232–241.

[18] Louis Romano, "The Role of 16mm. Motion Pictures and Projected Still Pictures in Science Unit Vocabulary Learnings at Grades 5, 6, and 7," unpublished Ph.D. thesis, Univ. of Wisconsin, 1955.

13.19). The fifth-grade pupils learned up to 300 percent more science vocabulary, the sixth-grade groups twice the vocabulary, and the seventh-grade groups 200 percent more than the control groups learned.

Four years later, Nicholas Georgiady studied the effect of the 16mm. sound motion-picture film and the use of related projected still pictures on vocabulary development and growth among pupils of the upper intermediate grades.[19] This study closely paralleled Romano's investigation, and the results almost matched those of the earlier study. Thus, two careful investigations of using films with related audiovisual materials substantiate the value of cross-media utilization.

SELECTION OF FILMS

The teacher of almost any subject and grade has available numerous sound motion-picture films. Today three of the leading producers of teaching films (Encyclopædia Britannica Films, Inc., Coronet, and Young America) release new ones at the rate of one or more each week. From this large supply the teacher must select the few that will improve the learning opportunities of the class.

The producer of a teaching film usually studies carefully the sales possibilities of a proposed film; he may also consider the teaching problems. If he believes the film can improve the learning situation, he will invest the time, effort, and money required for its production. This in itself is one important phase of film selection, for in the past many poor films were produced, with consequent bankruptcy for their producers.

Most distributors of teaching films ask teachers to try them out in their classrooms before they are purchased. This provides valuable information about the effectiveness of the films. In some cases teachers' comments are included in film catalogues.

The responsibility for film selection rests with the teacher. Before selecting a film he should have definite reasons for using one. If his students are to learn about the culture of people in North Africa, he assembles suitable learning materials, including such traditional materials as books, maps, a globe, bulletin board pictures, models, and specimens. His knowledge of what a film can contribute may lead him to search for a film; but he must consider the pupils' interests, maturity level, and reading ability in selecting *the* film which can make a real contribution to his class.

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[19] Nicholas Georgiady, "The Role of 16mm. Motion Pictures and Related Projected Still Pictures in Social Studies Unit Vocabulary Learning, Grades 6 to 8," unpublished Ph.D. thesis, Univ. of Wisconsin, 1959.

Fig. 13.20. For what age groups do you think this film, *The Grasshopper: A Typical Insect*, will make its greatest contribution?

CONSIDERATIONS IN SELECTION

Two considerations are basic to film selection: (1) the contributions made by the film, and (2) the quality of the film.

Contributions Made by the Teaching Film.

1. *The film contains authoritative information.*

In the past it was not at all uncommon to find gross errors in films for classroom use. Now, however, their production includes painstaking study and authentication of content. Today most teaching films carry the name of a well-known and respected authority on the subject of the particular film. The name on the title page of a textbook bears much the same relationship to the content of the book as does the name of a collaborator to the content of a film.

2. *The film is keyed to a definite age group.*

Many well-produced films present information on the same general subject, but it is presented in such a way as to be interesting and completely understandable to a specific age group, such as primary or junior-high-school children, or adults. (See Fig. 13.20.)

One film about polar bears describes their antics and habits in terms understandable by small children. Another film on the same subject painstakingly describes the genus *Thalarctus maritimus* (polar bears). It will be most interesting and understandable to college zoology students.

The teacher must search for the film that will challenge the age group it will be used with. The speed with which the film moves from scene to scene, the pace of the dialogue or narration, the age level of the content—all must be evaluated in terms of the learners who will use the film.

3. *The film contributes to the group learning situation.*

A film on social behavior records the dialogue used when making introductions, but practically the same dialogue will be found in any modern English textbook in use in a junior high school. If the textbook version accomplishes as much as the film version, the film makes no outstanding contribution.

In contrast there are films which bring remote people and places into the social studies classroom. Others show demonstrations involving equipment seldom found in classrooms. Still others present interesting, graphic, and authentic records of events that occur once in a lifetime. Because films of this type present experiences which cannot be presented by any other medium, they are extremely valuable in enabling a given learning problem to be understood completely.

4. *The film is keyed to the curriculum problem or unit of study.*

Film libraries contain a host of films which are authentic, interesting, full of information, and understandable by school children. The teacher must select the few which will give the students a more complete understanding of the unit of study on which they are working.

A film which compares two forms of government with the obvious purpose of "proving" the superiority of one over the other is not suitable for a Problems of Democracy class, but it might well be valuable in studying propaganda methods.

The question is no longer, Is the film interesting? but rather, Does it help in what the school is attempting to accomplish today?

Quality of the Teaching Film. Just as the teacher who is selecting a textbook or supplementary reader considers size of type, quality of paper, binding, illustrations, and general attractiveness, so the teacher in selecting films must consider similar characteristics—quality of photography, quality of the sound, general organization of content, and availability or lack of teaching aids.

1. *The film is well photographed.*

Instructional films must be photographed as vividly and carefully as possible. The film must be well lighted rather than too dark. The viewer must be able to see a well-defined projected image. The camera must be in focus so that the image on the screen is sharp and distinct. The photography must vary with the type of material; in other words, a subject must remain on the screen longer when time is needed to understand it, but for a shorter time when only an impression is required.

2. *Color is used if it will increase understanding.*

Many subjects—such as animals, mechanisms, objects in nature—are identified through color (see pages 371–372). When color is used it should be as close to the real color as possible. Color photography which is heavily overcast with bluish or greenish hues is not desirable because it does not portray the true natural colors. Poor color is often worse than no color at all.

3. *The film can be heard distinctly.*

Learning advantages are greatest when the viewer can see and hear what he is investigating. When sounds help identify an object or process, a clear, lifelike sound track is essential.

The film whose sound track has muffled or entirely inaudible low notes, or distorted, thin high notes, does not impress the viewer as being realistic. Today clear, natural, and easily heard sound films can be produced. The listener can hear a good teaching film so distinctly that he becomes engrossed in the visual experience and pays no attention to the quality of the sound itself.

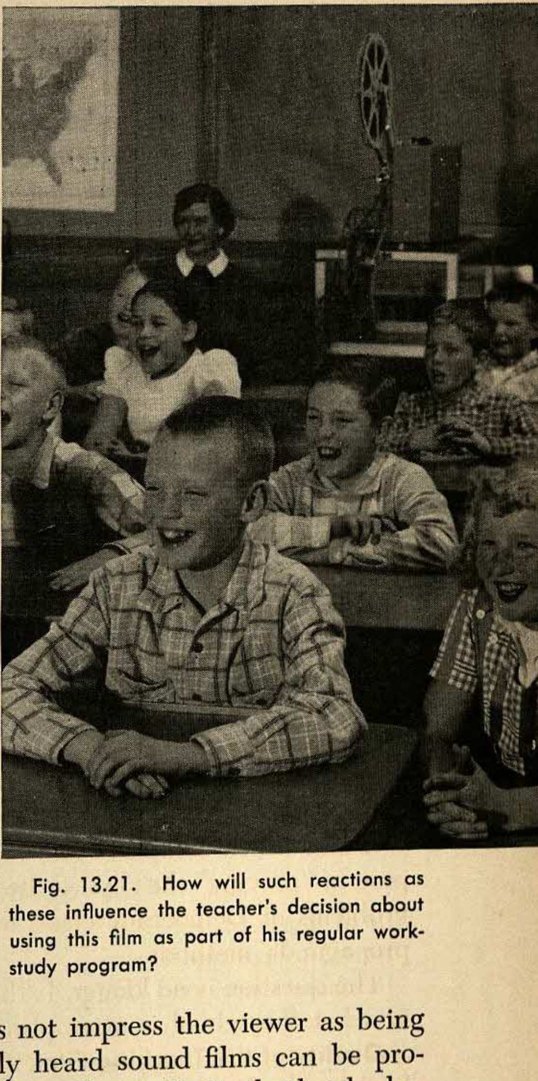

Fig. 13.21. How will such reactions as these influence the teacher's decision about using this film as part of his regular work-study program?

4. *The film is well organized.*

By organization is meant the smooth flowing together of the photographed scenes and the accompanying sound. The viewer is not conscious of this in a well-organized film because the narration or explanation moves along from scene to scene with scarcely noticeable shifts.

Such a film is punctuated and given meaning by the skillful use of mechanical devices such as fades (the slow disappearance of one scene before the next one appears), quick cuts (abrupt shifts from one scene to another), and dissolves (the merging of the end of one scene into the beginning of the next).

A film which is jerky, meanders, or has confusing sequences interferes with the audiovisual experience it attempts to create.

5. *The film usually has teaching aids.*

Teaching films are usually accompanied by teaching aids such as study manuals or suggestions concerning the effective use of the film.

SELECTION THROUGH PREVIEW

As was said earlier, the most effective way to select films is to preview them. Under some circumstances, this may be done in class so that the reactions of the students may be noted (Fig. 13.21). However, sound film equipment should be accessible to every teacher so that he may preview whenever films are available. *There is no substitute for preview.* In previewing he should keep in mind the points just discussed.

Unlike books, which can be quickly skimmed over if there is no time for more leisurely examination, a teaching film must be seen—if not in its entirety, at least as long as is required for the teacher to decide whether it is of such potential value that he should see all of it. A sound film takes 10 minutes for each 400-foot reel, and there is no satisfactory way of speeding it up.

Methodical previewing leads naturally to record keeping. Preview records kept over a long period of time enable the teacher to be informed about useful films in his subject area. The following record form is suggested:

FILM SELECTION GUIDE

Title of film .... Previewed by ....
Rental source and charge ....
Purchase source and charge ....
Produced by .... Subject collaborator ....
Use data
1. Is the film authentic? .... Comment: ....
2. Useful in grades ....
3. Are experiences contributed which are beyond what can be accomplished with traditional materials now used? ....
List outstanding contributions ....
....
....
....
4. Curriculum or unit of study use suggestions: ....
....
....

5. Color is not used .... is used .... to give meaning to such things as ....
....

Format
1. Photography: excellent, good, poor. Comment: ....
2. Sound: excellent, good, poor. Comment: ....
3. Organization of content: excellent, good, poor. Comment: ....
4. Accompanying study materials: ....
5. Color: superfluous, desirable, demanded for complete meaning. Comment: ....
....

Brief description of film content: ....
....

General film rating: excellent, good, poor: ....
Recommend for future use: Yes .... No .... Reason ....

EFFECTIVE USE OF THE TEACHING FILM

There are many ways of using a film in the classroom. We shall examine several possibilities. The following represents one level of film use:

TEACHER. This morning we are going to begin the study of simple machines. We will begin our study by seeing a film. It's a good film. Now keep your eyes and ears open and we'll all learn a lot! Lights out!

A second teacher is able to help her pupils obtain almost double the information from seeing and hearing the same film. The difference between what each class learns represents the difference between each teacher's plan for using it.

The teacher's role in film utilization is summarized in Fig. 13.22.[20] The upper bar indicates the level of achievement gained when pupils in the fourth, fifth, and sixth grades viewed a film without any organized prepara-

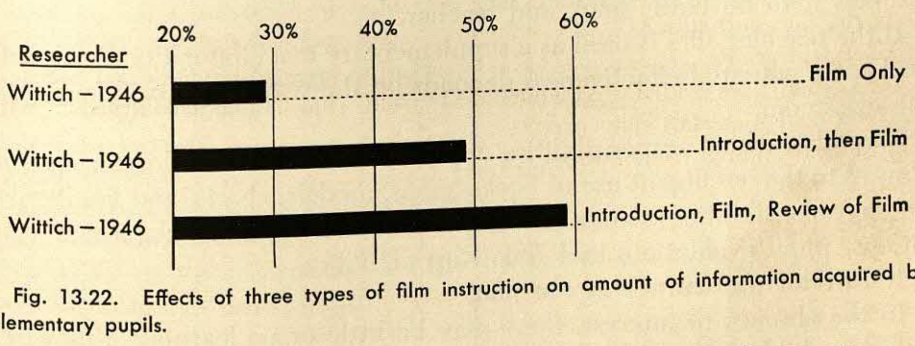

Fig. 13.22. Effects of three types of film instruction on amount of information acquired by elementary pupils.

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[20] Prepared from data presented in Walter Arno Wittich and John Guy Fowlkes, *op. cit.*

tion. The class had been prepared for seeing this film only in the course of casual classroom work. After seeing the film, the pupils answered test questions.

The middle bar indicates the level of achievement when these pupils viewed a film after being definitely prepared. The class was asked, prior to seeing the film:

1. To read a brief storylike description that conveyed a general impression or mood.
2. To study difficult words and phrases in the sound track.
3. To anticipate the content of the film by studying questions leading toward large areas of information presented in the film.
4. To view the film after the above three steps were completed.
5. To take a test immediately after seeing the film.

The third bar indicates the level of achievement when these pupils viewed a film after definite preparation and were given follow-up activities. In addition to the above five steps, the class was asked to do the following things twenty-four hours later:

1. To answer a prearranged series of discussion questions.
2. To see the film a second time.
3. Immediately afterward, to take the test a second time.

The figure shows that careful planning can nearly double the effectiveness of a teaching film in terms of the information acquired by the pupils who see it.

The teaching film is a powerful and useful instructional tool. Its ultimate effectiveness, however, is largely determined by the teacher and the way he uses it. In too many cases the film is considered a "package" of information. Because it tells a rather complete story or gives a well-developed explanation of a process or phenomenon, many teachers use it in a way that assumes it to be both "book and teacher."

If the teaching film is used as a supplementary teaching material, a great deal of its potential effectiveness depends on the way it is introduced into the classroom.

Several teaching responsibilities apply as surely to the effective use of films as to the intelligent use of books, maps, models, charts, and field trips. These responsibilities include interest, vocabulary, planning, classroom conditions, pupil evaluation, and follow-up activities.

1. *Interest the learner in the film.*

In the absence of interest, there may be little or no learning. Likewise, unless a child wants to see a film, he may learn little from seeing it.

The teacher can awaken interest in many ways. He can talk about the subject to be studied, and ask the children what they know or wish to know about it. For example, the following conversation preceded seeing the film *Farmers of India* (Sound, B&W, 17 min., United World):

TEACHER. What ideas do you have about the farmers of the Ganges River valley of India? (*Pause while the children think.*)
PUPIL. They worship cows and insects.
PUPIL. They have many strange customs.
PUPIL. Too many people live in India—so many that they all don't have enough to eat.
PUPIL. They have queer music—it sounds all "clangy" and "high."
PUPIL. They're not very bright.
TEACHER. Why do you think that, William?
WILLIAM. I'm not exactly sure. I've heard that, though.
TEACHER. William says he *heard* that the Indians were "not very bright." Is that a good way to get information?
CLASS. No.
PUPIL. He should try to find out if what he's heard is right.
TEACHER. How can you find out, William?
WILLIAM. I can read about it—or ask you.
TEACHER. Yes, read books about India. And, since this is going to be your job, I'll expect you to find answers.
PUPIL. We could look at a film about India and the farmers who work there.
TEACHER. Yes. Now let's return to my first idea. What *questions* do you have about the farmers of the Ganges River valley of India?
PUPIL. The people! What are they like?
PUPIL. How do they dress?
PUPIL. The children! Do the children go to school?
TEACHER. I'm glad someone mentioned children.
PUPIL. Do they play games?
PUPIL. I'd like to see their homes. I wonder if they're like ours?
TEACHER. Let's put some of our ideas and questions on the chalkboard.
(*Teacher begins the following lists:*

1. Ideas I have about farmers of India
   a. Strange customs
   b. Poor farmers
   c. Little food, etc.
2. Questions I have about farmers of India
   a. What are houses like?
   b. What are the children like and how do they work and play?
   c. How do they dress? etc.)[21]

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[21] Excerpt from recorded classroom discussion in which one of the present authors participated.

By asking a challenging question or two, this teacher has gained the attention and interest of his pupils. Regardless of what they were thinking about when he began, more and more of them are now thinking about the subject to be studied, India and the people who live in the Ganges valley.

This teacher knows that if he can help the learner express his own questions about India, the student will discover real and personal reasons for finding answers to them. As this class discussion continues, the children will assume more responsibility for answering their own questions, for seeking new information. Soon they will be "ready" to acquire information from the teaching film itself.

There are innumerable ways in which an ingenious teacher can awaken his pupils' interest in the subject being studied, and specifically in the materials being used. Regardless of the one he chooses, he must meet this responsibility.

2. *Anticipate vocabulary problems which may interfere with comprehending the film.*

The general science class had just finished a unit on simple machines and was about to begin a new unit on gravitational force. The teacher started to show the film, *Gravity the Mighty Pull* (Sound, B&W, 14 min., United World); all eyes were fixed on it. The sound track for the animated sequences used new and unusual terms—gravitational force, orbit, perigee, weightlessness, etc.

The teacher, noticing increasing shuffling and inattention among the pupils, shut off the projector.

"You seem to be having some difficulty," he said. "What is it?"

"I don't understand," said one pupil. "It goes too fast—it's all those words."

"What should we do about it?" asked the teacher.

There was a pause, then suggestions began to be heard.

"When we read, we have a chance to study 'tough' words."

"Yes, look them up!"

"But with a film you can't."

"Not while it's going . . ."

When a film contains new words, as the film on gravity did, the situation almost demands that the meaning of key words be studied *before* the film is shown.

When using special-content films in history, language arts, science, or human biology, the teacher must recognize that the film explanation has been carefully planned to include words that have precise meanings, so that their use along with the visual film sequences will have the maximum learning impact. All this anticipates vocabulary study if the film is to be an economical, fast-moving communications medium.

The sound track of the film, *Digestion of Foods* (B&W, 10 min., EBF), has a specialized vocabulary which includes the following terms, among others:

digestive movements
peristaltic
intestines
gastric juice
duodenum
pancreatic juice

These words may be big, but they are the language of biology and therefore necessary. If we wish to learn about digestion, we have no alternative but to know the meaning of special words used to describe the process.

Teaching the meaning of words which are specific to a given subject area is the responsibility of the teacher of that subject. Since every special subject has its own vocabulary, every teacher is a vocabulary teacher, at least to some degree.

Some new words may be explained by the film itself, because visual concept and word concept are closely related. But other words should be studied beforehand so that learning will be enhanced rather than retarded when the film is shown.

Although the learner will acquire the meaning of some of the words from the film and the word descriptions, the organization of a film usually implies certain levels of ability and knowledge. Moreover, the film often proceeds at a pace which does not permit the pupil to think about the meaning of specific words or scenes.

The need for specific vocabulary study is apparent in almost every area of film utilization. Many pupils lose all the advantages of learning from films because they are allowed to see the films without proper vocabulary preparation.

3. *Help the learner plan his search for information before he sees the film.*

Often the most effective study plan a pupil can make involves his awareness of questions to which he seeks answers. When the teacher asked, "What questions do you have about the farmers of the Ganges River valley of India?" the children listed the following:

1. What are the people like?
2. How do they dress?
3. What are their homes like?
4. Do the children go to school?
5. What games do they play?

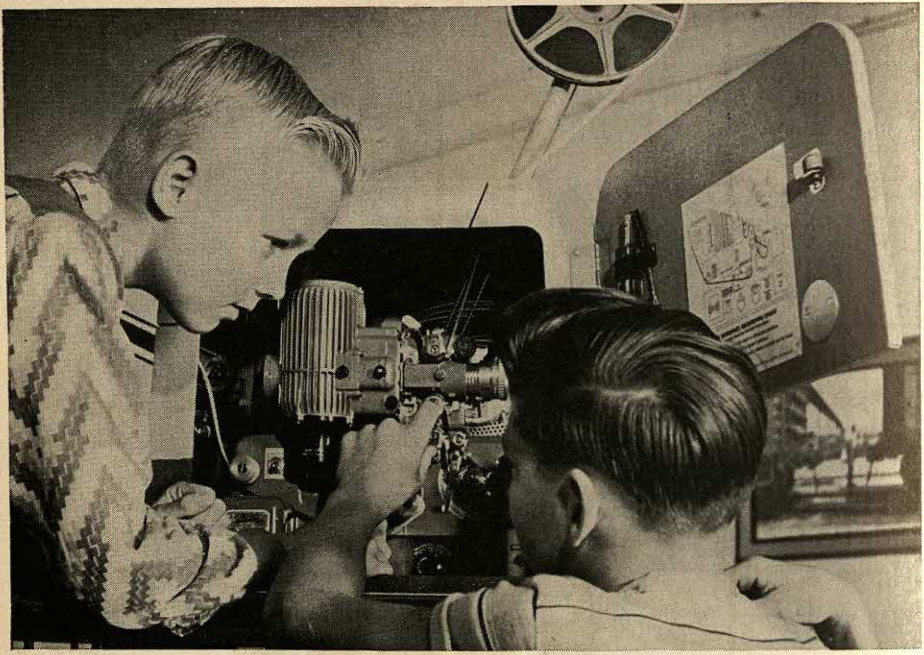

Fig. 13.23. Under what circumstances can pupils help create a good classroom viewing situation?

The children responded with these questions because they actually existed in their own minds. Hence these questions form one part of a study plan which is not only interesting but very important to the children themselves.

A good study plan is largely an expression of the pupils' own search for answers and information. It is not teacher-imposed; rather, it is an outgrowth of pupil-teacher planning.

The learner will best approach the viewing of a film if he has in mind known, clear-cut purposes for seeing it. A film-study plan will help him organize his impressions, and the experience of seeing it will itself take on additional meaning.

For many reasons the teacher will want to add his ideas to the study plan. He may ask additional questions, emphasize some the pupils have suggested, or warn the class against being disappointed if all their questions fail to be answered by viewing a single film.

4. *Create the best possible classroom conditions for viewing the film.*

Because pupils work on day-to-day school projects in their own classroom, it is here that teaching films should be viewed. Classrooms should be so arranged and equipped as to allow every pupil to see a well-defined image on the screen, and to hear the sound track without distortion or strain (Fig. 13.23).

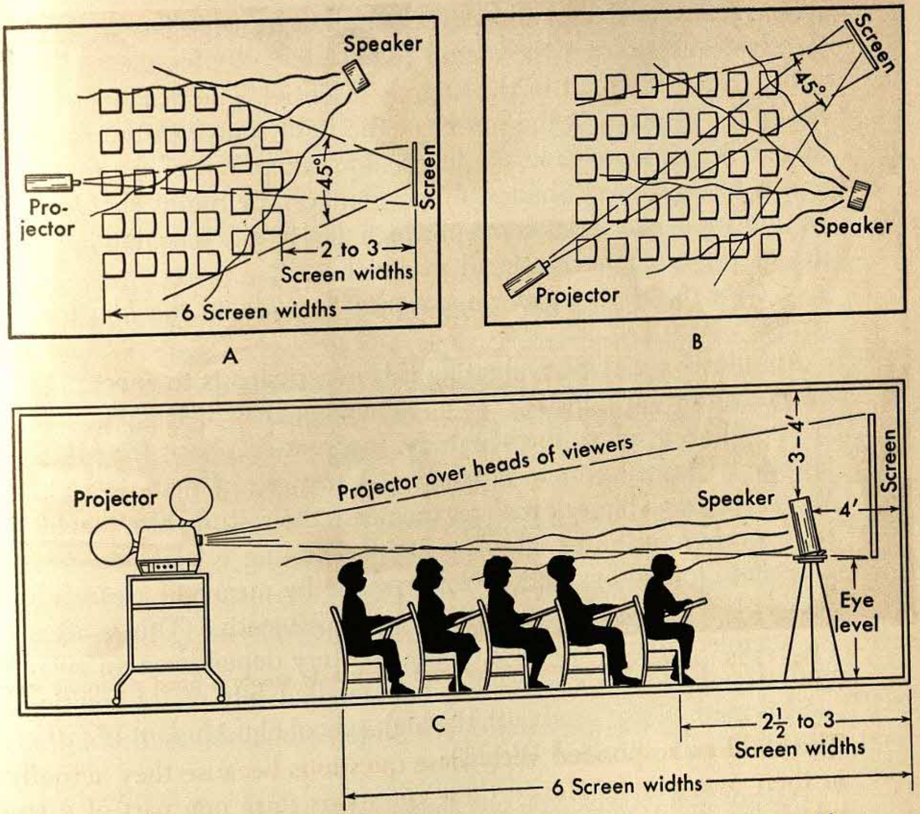

Fig. 13.24. Suggested classroom projection arrangements. *Top left:* In classroom with movable chairs or desks; *top right:* in classroom with fixed desks; *lower:* projection over the pupils' heads. The speaker should be placed so that the sound is at or slightly above ear level and is directed at the center of the listening group.

Before a film is shown, the projection equipment should be set up and placed properly in relation to the screen. The film should be threaded into the machine and the projector tested for focus and sound so that it can be switched on the moment the class is ready to see the film.[22]

The screen should be of such size and so placed that all can see it perfectly. By walking from pupil to pupil, the teacher can quickly judge the viewing and hearing conditions for each child in the room. (See Fig. 13.24.)

Room ventilation should duplicate the general air-change and circulation specifications recommended by school building authorities for regular classroom use, namely, 15 cubic feet per person per minute.[23]

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[22] *Facts About Projection*, 2nd Edition, Sound, Color, 16½ min., and *Facts About Film*, 2nd Edition, Sound, Color, 16½ min., both of them International Film Bureau.

[23] National Council on Schoolhouse Construction, *Guide for Planning School Plants*, Nashville, 1949.

The acoustics should allow every pupil to hear lifelike, completely understandable tones from the sound track.

Control of the light in the room is essential. The distance from the camera to the screen and the power of the light source in the projector determine whether more or less light should be kept out of the room in which a film is being shown. Shades, drapes, louvers, or blinds should be standard equipment in every classroom in which day-to-day teaching incorporates the use of projected instructional materials.

5. *Give the students an opportunity to evaluate the film learning experience.*

An effective way of evaluating this experience is to encourage pupil discussion after the film has been shown. Such a discussion can reveal to the pupil his need for further study. It serves as a basis for (1) reference to additional learning materials and (2) restudy of materials already used. When the pupil himself realizes the need, the restudy of a teaching film can be a purposeful and highly profitable learning experience.

A more formal evaluation can be made by means of a carefully planned series of written questions, either essay or objective. This is often desirable for a subject that is complex, whose mastery depends on an awareness and understanding of many related but detailed bits of information.

This method was used with the high-school film *Modern Weather* (Sound, B&W, 19 min., United World):

Test yourself on what you saw and heard in the film.

To indicate the correct answer, draw a line under it, check it, or fill in the blank with the right word or words.

1. Water which is at rest may be set in motion by heating a portion of it, causing convection currents of water due to unequal temperature. .... TRUE FALSE
2. Convection currents of air may also be produced by unequal temperatures. .... TRUE FALSE
3. By heating air, its density is increased. .... TRUE FALSE
4. Warm air tends to rise because it is displaced by heavier cold air. .... TRUE FALSE
5. The rotation of the earth deflects the direction of convection currents of air. .... TRUE FALSE

The greatest heating of the air will take place near the (6) .... because at that location the sun's rays are more nearly (7) .... to the earth's surface.

The speed of the rotation of the earth at the equator is approximately (8) .... miles per hour; at a point 30° north or south latitude it is approximately (9) .... miles per hour.

The deflection of air currents as they move toward the poles is the result of the variations in the speed at which the surface of the earth is moving in space; therefore, the deflecting force is greatest at the (10) .... and zero at the (11) ....

High altitude convection currents—cold, dry and dense—proceed from the equator toward the poles; due to rotation of the earth, they spiral to the (12) .... in the northern hemisphere and to the (13) .... in the southern hemisphere. Etc.[24]

Evaluation of the learning that results from viewing films is an essential step in any plan for their effective use in the classroom. It shows to what extent learning has been accomplished, and it can specifically define individual progress and individual needs for further work on the subject.

6. *Provide for follow-up activities which develop naturally from viewing films and are pupil-teacher planned.*

If seeing a carefully selected teaching film is a means of acquiring background or readiness experience, this film viewing can become the basis for countless follow-up activities in written expression, oral communication, art, number activity, project work, etc. These activities may have a wide range, depending on pupil interest and ability, but teacher and pupil should plan them together.

After the film *Desert Nomads* (Sound, B&W, 22 min., United World) was shown to intermediate-grade pupils, the following planning took place:

TEACHER. Did we find answers to all our questions?

GIRL. I wanted to find out more about the foods they were preparing.

TEACHER. What did you discover?

GIRL. I found out how couscous is made [ground barley steamed over lamb broth], but the film showed they were eating other things, too.

TEACHER. If you're really interested in finding out about other "dishes" they prepare, what could you do about it?

GIRL. I could read books about it.

TEACHER. Yes, but are you going to be satisfied with just reading about their food?

GIRL. Could we make some of their dishes?

TEACHER. Not very well right here—but—who has an idea?

GIRL. I think Miss Weltin [Home Economics teacher] would let us try some recipes.

TEACHER. Where will you get the recipes?

GIRL. Maybe she has some, maybe the librarian would help us. . . .

TEACHER. Would you like to try? (*Eleanor responds enthusiastically.*)

TEACHER (*continues*). I'd like to have you try, Eleanor. Is anyone else interested? (*Several hands appear.*) Martha, Ruth, Geraldine and . . . O.K., Bob, you can

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[24] Visual Learning Guide for *Modern Weather,* National Audio-Visual Council, Chicago.

> join the group. Now you get together over there with Eleanor, she's your chairman, and plan exactly what you'd like to do. . . .[25]

Within a few days some interesting North African dishes were tried out in the Home Economics room.

Other groups did some simple reading research before constructing a "table-top oasis." Free reading practically exhausted the library shelf of stories laid in desert regions, and descriptive accounts of desert areas, living conditions, and geography were eagerly sought.

A group interested in art worked their study information into a collective mural. Requests went to the music teacher to spend part of the hour on folk music of North Africa. A poem which one of the children found was adapted to choral speaking; and the blank space on the bulletin board was covered with pictures and news clippings, all pupil-arranged.

A senior English class viewed the *Great Americans* series, which includes *Franklin, Longfellow, Alcott, Cooper, Jefferson,* and others (all the films Sound, B&W, 16 min., EBF). This led to a class-planned essay assignment, to "If they were alive today" radio interviews, to reports on the independent reading of "works" not in textbook anthologies, and to original "television" dramatizations of interesting episodes in the lives of these men.

Films which show how-to-do-it procedures invariably are followed by the formation of groups headed toward creative efforts. Following the showing of a film explaining the preservation of milk in cheese form, the intermediate-graders interviewed store managers, dairy men, and druggists until they had the information they wanted. They then tested their information and made cheese themselves.

After their study of housing, a junior-high-school group located films on brickmaking and concrete construction, and then assembled the materials they needed to make crude but durable bricks.

The strength of the teaching film lies in its graphic portrayals. Film-inspired pupil activity is a natural outgrowth of viewing these films. Unless provision is made for follow-up activity that is intelligently planned by teacher and pupils, one of the greatest values of using educational sound films will be lost.

SOME NEW DEVELOPMENTS

THE MAGNETIC SOUND FILM PROJECTOR

A new device, the magnetic sound film projector, is actually a combination 16mm. sound motion-picture projector and tape recorder. This magnetic film projector permits the teacher to record voice or sound on a commercially produced sound film, or to add voice or sound to a silent film (Fig. 13.25).

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[25] Recorded classroom experience of one of the present authors.

The first step in recording on a sound film is to send the film to a laboratory to have it "sound striped." This is done by painting a thin stripe of magnetic material on half or all of the sound track. This creates a narrow recording strip on the film.

The teacher then records his own words or desired sound effects on the film with the magnetic recorder in much the same way as he uses a tape recorder. If the film has been half-striped, he can play back either the sound effects he recorded or, by flipping the proper switch, the original sound track. Thus a history teacher can record his own interpretation of a film, a geography teacher can change the vocabulary level of the original film.

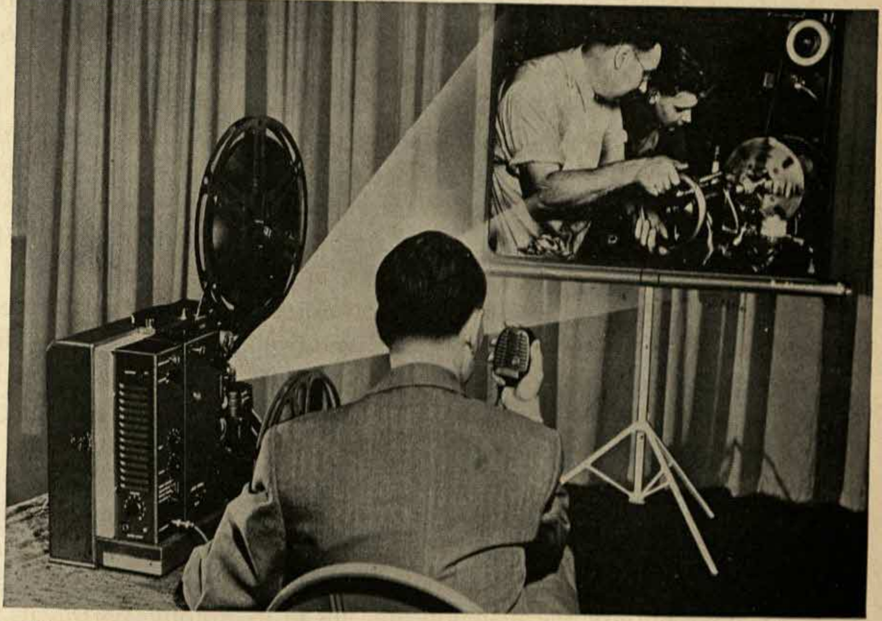


Fig. 13.25. Magnetic sound equipment enables the teacher to use the existing sound track or to record one himself.

Athletic events, plays, school events, etc., can be photographed with a motion-picture camera. The resulting silent film can then be sound striped; and explanations supplied by the coach, principal, or teacher can be recorded by means of the magnetic sound film projector.

8MM. SOUND MOTION PICTURES

The first motion-picture films were 35mm. An improvement was made in the early 1920's, when the 16mm. motion-picture film was developed.

A new device which combines an 8mm. sound motion-picture camera and sound recorder with a projector is on the market (Fig. 13.26).

Although few 8mm. sound films are at present available for classroom use, teachers who are interested in recording school events, community-school projects, or classroom activities should investigate this equipment.

COMPLETE COURSES ON SOUND MOTION-PICTURE FILM

School persons have completed experimentation with complete courses on film. Such courses may present the entire subject matter, or supplement the classroom teacher's day-to-day instruction.

The first of these courses, the Dr. Harvey White beginning course in physics, is a series of 162 half-hour sound-film demonstrations and lectures by this outstanding teacher (Fig. 13.27). This series has been used experimentally in several parts of the United States; the results have been so important as to presage an entirely new concept of classroom instruction.

A group of 117 Chicago public-school pupils studied the complete two-semester physics film series via television. Although the film study groups had a slightly higher average IQ (116 for them, as against the national physics class norm of 114), on the During Physics Tests, Form BM, they had an average score of 124, or a percentile rank of 78, as compared to the national percentile rank of 50.

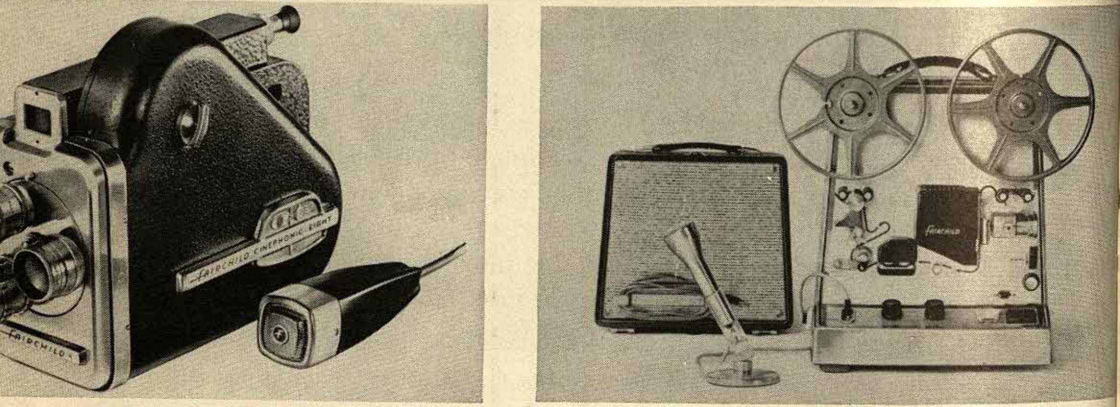


Fig. 13.26. The new 8mm. sound motion-picture recording and playback equipment.

In 1957–1958, 60 high-school districts in Wisconsin investigated using the White physics films as supplements to the daily classroom instruction. There was no significant difference in the scores on standard or traditional physics tests made by the pupils who used films and those who did not. However, there were significant differences in the scores of the film-using groups on achievement tests which measured mastery of information in modern phys-

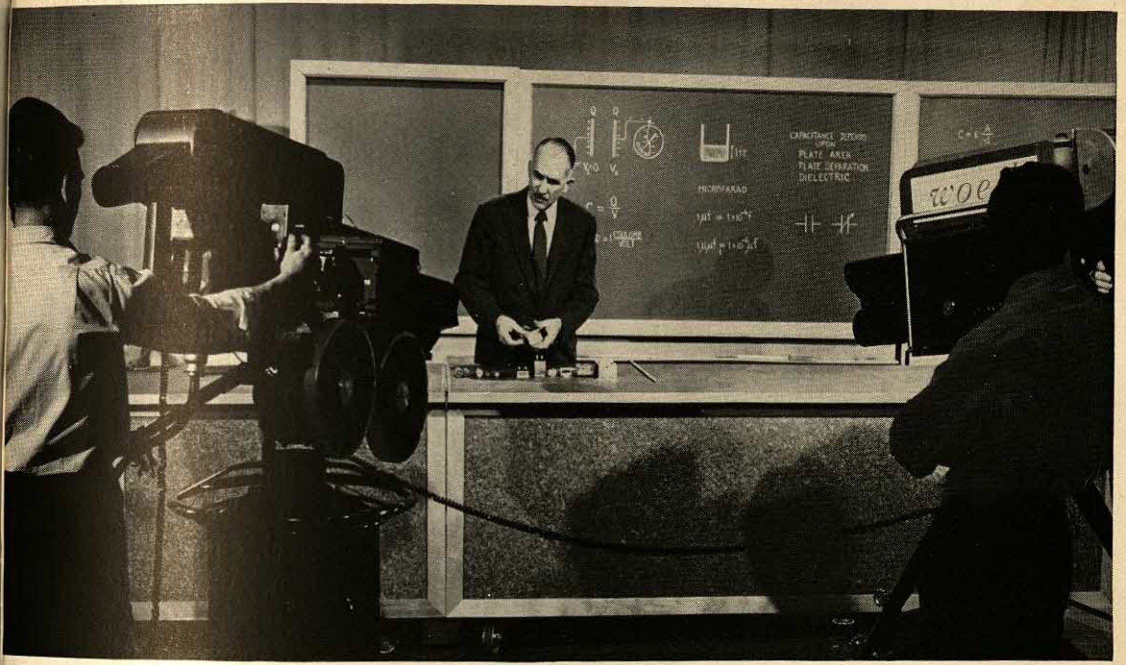


Fig. 13.27. Dr. Harvey White has pioneered in creating a film course in physics which pupils may complete in one year or less.

ics. It was also established that correspondence school students who studied physics on film made fewer errors, completed the course more quickly, and achieved a higher level of mastery than correspondence school students who did not use the filmed course.

A similar film course is now available in chemistry (*Chemistry, an Introductory Course*, Sound, Color, 160, 30-min. films in a series, EBF) and in biology (McGraw-Hill).

SUMMARY

During thirty years of research concerning its role and usefulness in classroom learning, the strength of the 16mm. motion-picture film has been demonstrated. Language laboratories, educational television, and other techniques have appeared since 1950, but the importance of the 16mm. sound motion-picture film continues.

This medium offers many opportunities for the improvement of instruction. Through basic motion-picture techniques such as direct and changing-speed photography, photomicrography, and animation, great areas of desirable but heretofore inaccessible instructional experiences and visualized explanations can now be brought into any classroom.

Two broad types of sound motion-picture films are being used in classroom work: (1) the basic teaching film and (2) the supplementary teaching film. The latter, although produced for other purposes, is often useful in instructional situations. New forms of the basic teaching film have been produced, some of them the result of television recording techniques. Whereas motion-picture films were previously thought of as piecemeal additions to course of study learning materials, today complete courses on film are available.

The classroom use of teaching films has many values. For example, pupil interest is heightened, more learning is accomplished, the retention of learned material is more permanent, and interest in reading is increased.

The teacher who uses films in the classroom must accept new and increased responsibility if they are to be used with greatest effectiveness. He must choose wisely from large numbers of teaching films those that will make the greatest contribution to the classroom situation. In selecting, he must consider such characteristics as authenticity, grade level, curriculum purpose, quality of photography and sound, organization, and study helps.

The greatest responsibility is incurred when the teacher prepares to use the film in the classroom. A film should never be accepted as a mechanical substitute for good teaching. Rather, a carefully selected teaching film is a tool which, wisely used, can bring results in terms of interest, learning, and pupil activity far beyond those heretofore possible with traditional learning materials.

Other teacher responsibilities in using films in the classroom include awakening pupil interest and the desire to learn, providing vocabulary study before the film is shown, planning with the pupils their purpose in seeing films, providing for pupil and group evaluation and for follow-up activities that he plans with the pupils.

In the hands of an intelligent, well-trained, and understanding teacher, the teaching film can be a vivid, interesting, dynamic, and socially useful instrument of instruction.

Suggested Activities

1. Refer to the diagrams in this chapter on the motion-picture projector, sound recording and reproduction. Use them to help you learn to operate as many kinds of 16mm. sound motion-picture projectors as are available for class use. View the film *Projecting Motion Pictures* (Sound, B&W, 18 min., International Film Bureau), and discuss good room arrangements and projection techniques.

2. View films which explain the usefulness of films in instruction, such as:
    a. *Facts About Film,* 2nd Edition, Sound, Color, 16½ min., International Film Bureau.
    b. *Facts About Projection,* 2nd Edition, Sound, Color, 16½ min., International Film Bureau.
    c. *Film Research and Learning,* Sound, B&W, 15 min., Teaching Materials Service, Beloit, Wis.
    d. *Instructional Films, the New Way to Greater Education,* Sound, B&W, 25 min., Coronet.
    e. *Making Films That Teach,* Sound, B&W (and color), 25 min., EBF.
    f. *Operation and Care of the Bell & Howell Sound Projector,* Sound, B&W, 22 min., International Film Bureau.
    g. *Operation and Care of the RCA Projector,* Sound, B&W, 18 min., International Film Bureau.
    h. *Projecting Motion Pictures,* Sound, B&W, 9 min., UCLA.
    i. *Using the Classroom Film,* Sound, B&W, 22 min., EBF.
3. In terms of your own subject-matter interests, select a film and plan for its use in a teaching situation. Note the responsibilities the teacher accepts when using a film in the classroom, and keep them in mind as you make your plan.
4. Arrange to put your plan into use. Either as a teacher in your own classroom or as a student teacher in a "practice classroom," introduce, project, evaluate, plan for, and guide the follow-up activities for your film.
5. Keep a diary of the pupil reactions, questions, and outcomes you note during the film lesson. At the completion of the lesson, consult this diary and evaluate your success or oversights in terms of the above responsibilities.
6. Following this self-evaluation, select another film and plan to use it in the classroom. Afterward, record results and again evaluate your effectiveness in teaching with films.
7. Preview many sound motion pictures. Secure the films from such sources as a teachers college or university film library, public-school audiovisual director, public library, local representatives of industry, county agent, county medical officer, Red Cross office, local commercial film dealer, etc. After previewing the films:
    a. Classify them as basic or supplementary (subdivide the latter).
    b. Locate, project, and discuss the educational significance of the portions of these films which employ direct photography, changing-speed photography, photomicrography, and animation.
    c. Judge the effectiveness of these films in terms of the criteria in the film selection guide on pages 390–391.

Bibliography

Arnspiger, Varney C., *Measuring the Effectiveness of Sound Pictures as Teaching Aids,* Teachers College, Columbia Univ., 1933.

Caudill, William Wayne, *Toward Better School Design,* F. W. Dodge Corp., 1954.

Chicago Physics Film Experiment, Chicago Board of Education, 1957–1958.

Dale, Edgar, *Audio-Visual Methods in Teaching,* Dryden, rev. ed., 1954.

De Bernardis, Amo, *The Audio-Visual Projectionist's Handbook,* Audio-Visual Publishers, 1948.

Hoban, Charles F., Jr., and van Ormer, Edward B., *Instructional Film Research 1918–1950 (Rapid Mass Learning),* U.S. Department of Commerce, Special Devices Center, 1951.

Instructional Film Reports, Technical Report No. SDC 269–7–36, U.S. Department of Commerce, Special Devices Center, 1953.

Magnetic Sound Recording for 16mm. Motion Pictures, Eastman Kodak.

Mannino, Phillip, *ABC's of Visual Aids and Projectionist's Manual,* State College, Pa., rev. ed. 1959.

Rotha, Paul, *Documentary Film,* Faber and Faber, 1936.

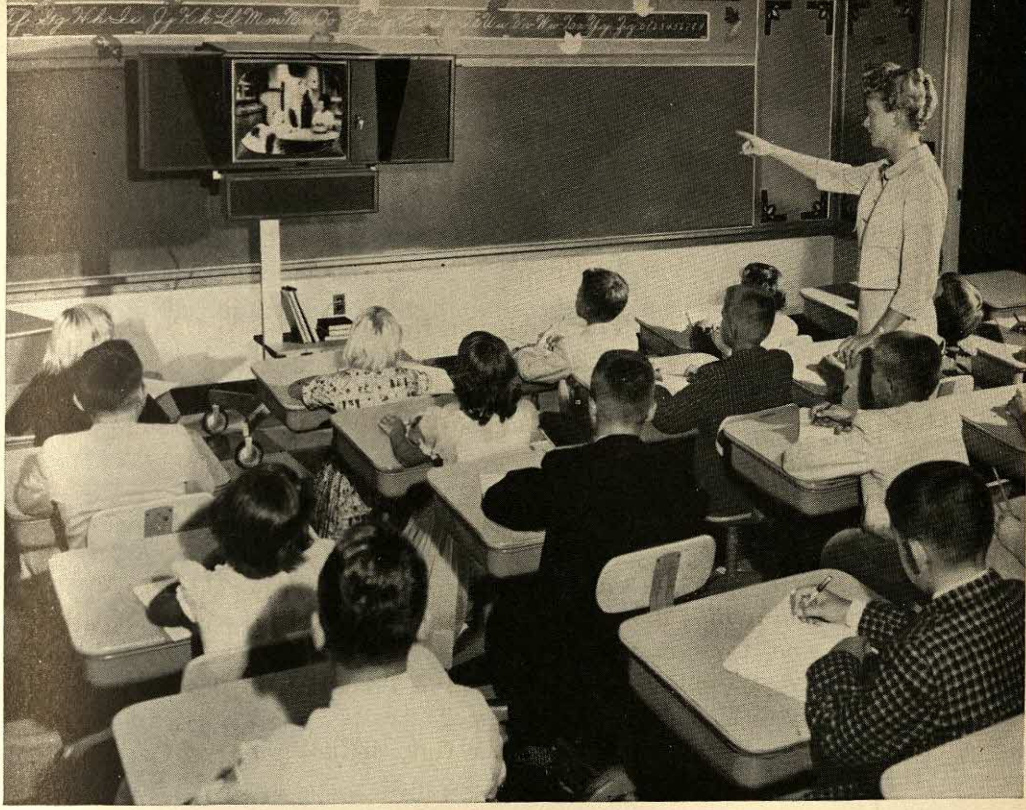
Rulon, Philip J., *The Sound Motion Picture in Science Teaching,* Harvard Univ. Press, 1933.

Sands, Lester B., *Audio-Visual Procedures in Teaching,* Ronald, 1956.

Wisconsin Physics Film Project Reports, Part I—1959, Part II—1961, Department of Education, Univ. of Wisconsin.

Wise, Harry A., *Motion Pictures as an Aid in Teaching American History,* Yale Univ. Press, 1939.

Wittich, Walter Arno, and Fowlkes, John Guy, *Audio-Visual Paths to Learning,* Harper, 1946.



CHAPTER 14

TELEVISION IN EDUCATION

TIME—ANY EVENING AFTER DUSK.

You enter almost any living room, that is, any living room in the 54,000,000 American household units equipped with television receivers today, and what will you probably find? Most of the family—well, the children anyhow—lost in what they are seeing on the television screen.

The statistics tell you that the number of hours children spend "glued" to the television set is *not* declining to the extent prophesied ten years ago. That this is true is shown in Fig. 14.1.

Why is television so fascinating? Why has it captured the continuous attention and interest of children and adults alike? How does it work? Can it be used in classrooms? What is the status of television?

This chapter will answer some of these questions by describing local, state, and regional programs of educational television. Educational television is in a rapidly changing, highly fluid state; accordingly this chapter discusses the broad sweep of events that mark its current development, as well as the responsibilities teachers assume in using the various kinds of programs available at present.

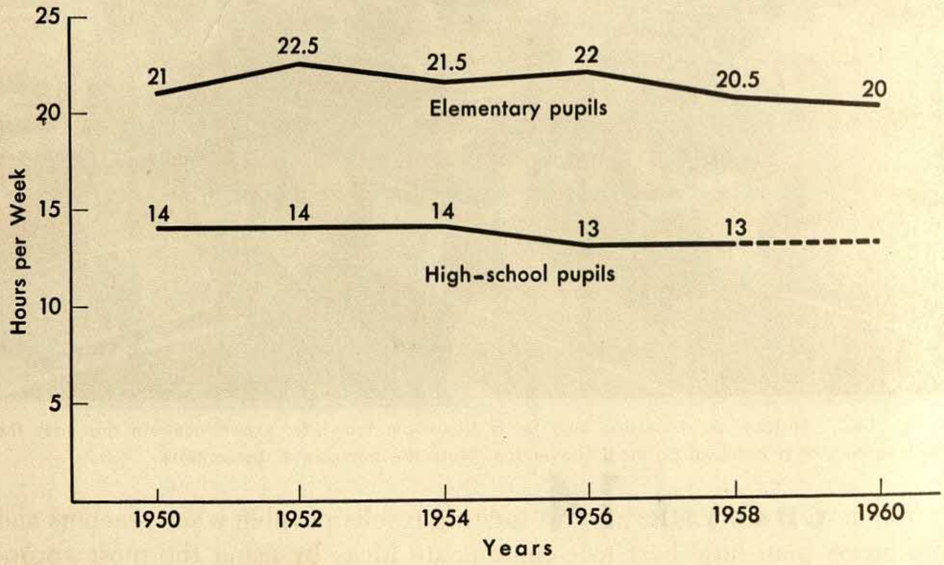


Fig. 14.1. Average hours spent each week in televiewing by from 1500 to 2000 pupils in the Chicago and Lake Shore area.

TELEVISION—AN AUDIOVISUAL SYNTHESIS

"When I first began to work in television programing," a midwestern educational television producer said, "I found myself producing what I now call *pictures of radio programs*—we 'took pictures' of people talking into a microphone.

"Today, I think of television as a tremendous carrier wave for all or any of the things we associate with the audiovisual field. On any one school television program we may find use for film clips—i.e., short lengths of motion-picture film—charts and diagrams, verbal descriptions, chalkboard illustrations, slides, models, specimens, short segments of tape recordings—every audiovisual device which at a given place in the program will 'get the idea across best' to the viewer."

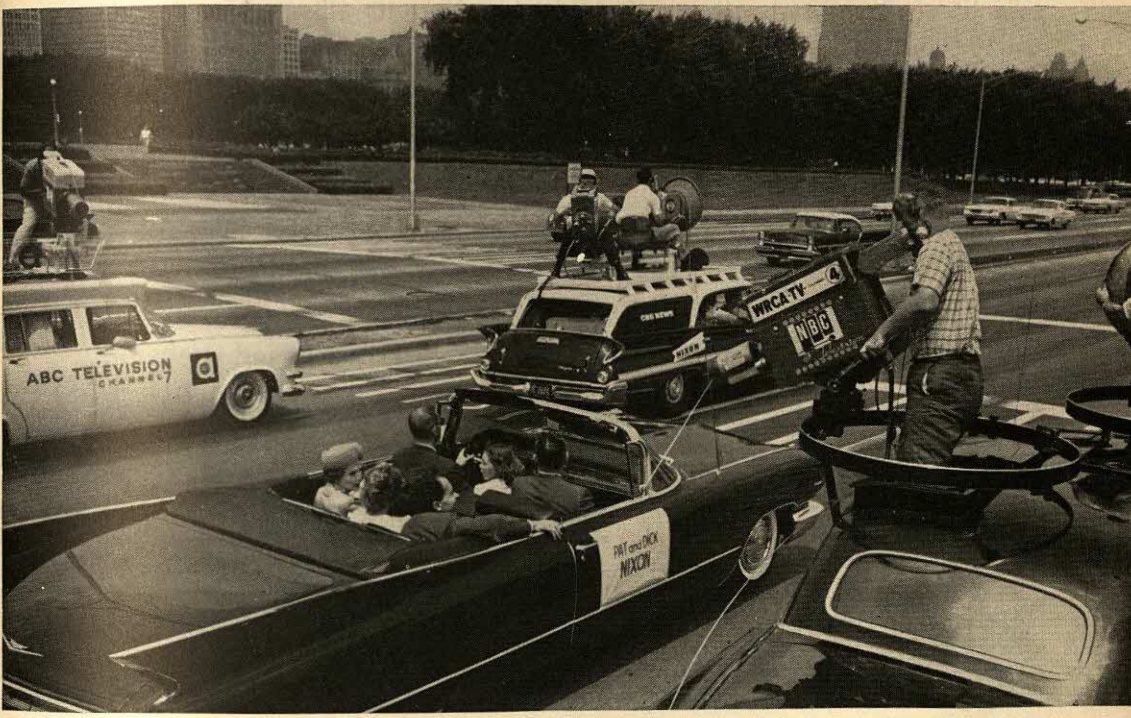


Fig. 14.2. History, as it occurs, may be a classroom television experience—in this case the documenting of a national political convention. Note the microwave transmitters.

When we consider the interest-inciting results possible when teachers and producers plan how best to communicate ideas by using the most appropriate audiovisual technique, we begin to understand the teaching and learning potentialities of television.

Another factor is its timeliness.

For the first time in history we can be eyewitnesses to events that occur *now, anywhere* within the range of the television camera—the launching of the first atom-powered submarine, the opening of the spillway of a great dam, the passage of the first ocean vessel through the St. Lawrence Waterway, the arrival of the first transcontinental mail rockets, the successful flight of the Project Mercury astronaut.

Master teachers can televise their expert demonstrations, their object-lesson explanations of grammar or arithmetic, their handcraft techniques, their descriptions of foreign cultures and people. Television is a means of bringing enrichment experiences into the classroom.

As teachers, we should understand the great hold television has on our young people, and we should also realize its potential strengths and the apparent danger of its reducing viewers to a passive, dream-world identification with what is all too often provided by television entertainment today.

To understand the role of television in the contemporary social scene, it is well to begin by gaining at least a rudimentary understanding of it as an electronic device.

HOW TELEVISION WORKS

Television is a means of converting a scene into an electronic image. This image is sent through space, picked up on an antenna, and translated into a duplicate of the original scene on the surface of a picture tube or, to use the correct name, kinescope.

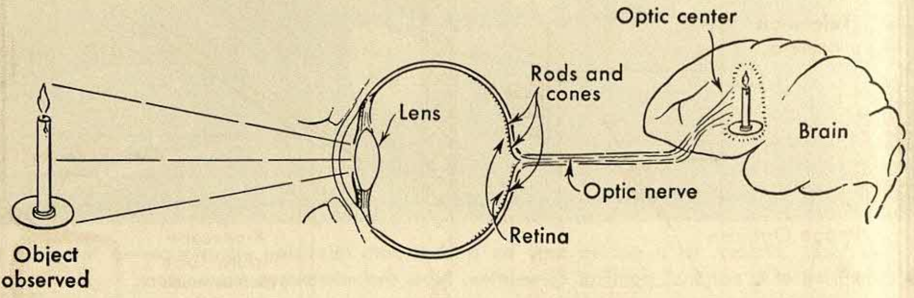


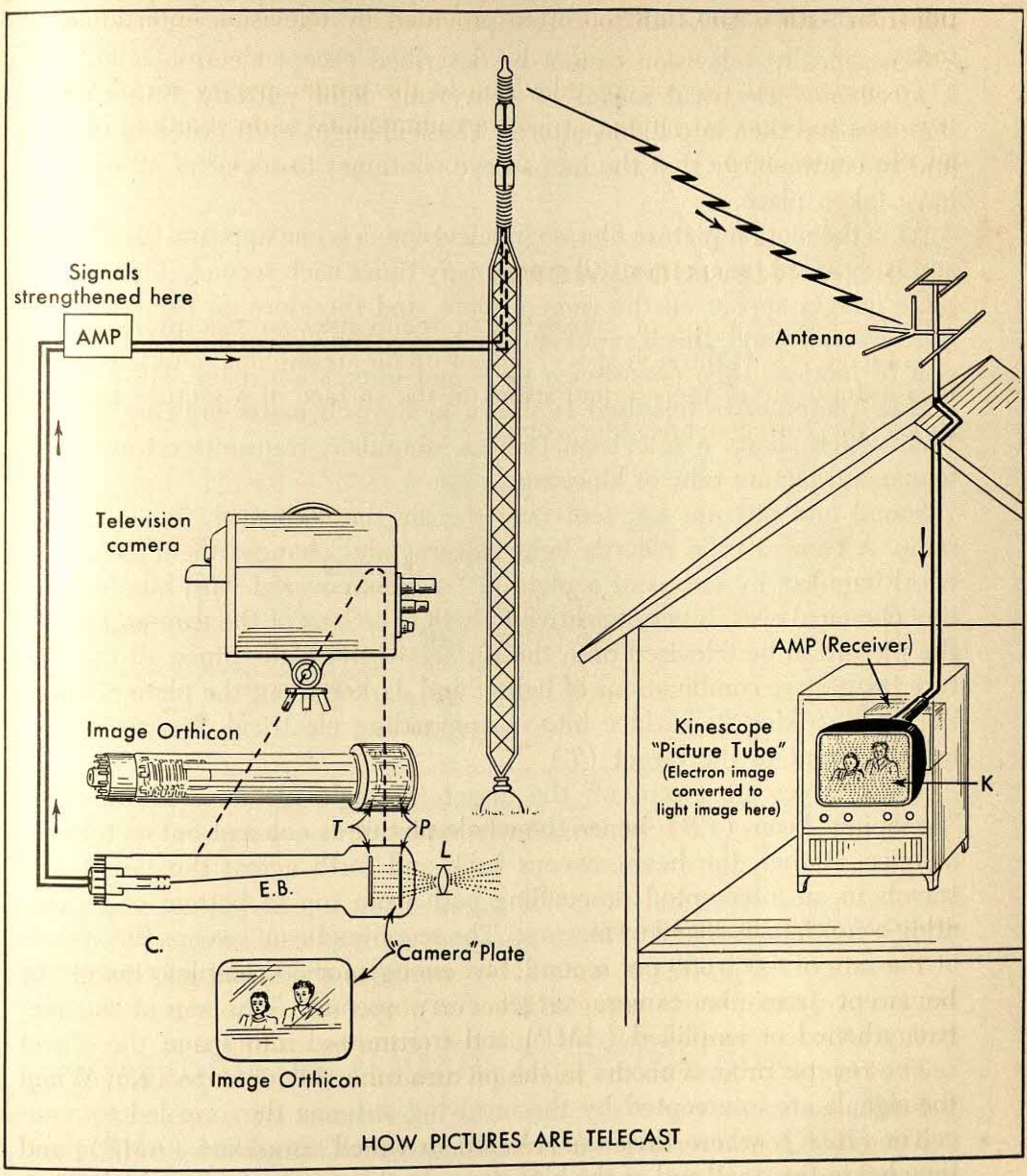
Fig. 14.3. How the eye functions.

ANALOGY WITH THE HUMAN EYE

The television process is remarkably similar to the visual process of the human eye. Light waves reflected from an object strike the lens of the eyeball, which focuses these waves onto the retina as an image of the object seen (Fig. 14.3). So with the television camera or "eye"—it too moves and focuses.

The retina contains myriad nerve endings which are sensitive to light and which "record" each tiny portion of the image that falls on the retina. Similarly there are thousands of tiny light-sensitive "nerve endings" on the television camera "retina" or plate. These react to the strong and weak light areas in the image received.

In the human eye, the optic nerve carries the light signals from the thousands of retinal nerve endings to the brain, where the "picture" of the object being viewed is perceived. In the television camera, minute electric currents are "swept" off the surface of the light-sensitive "retina" by a



HOW PICTURES ARE TELECAST

Fig. 14.4. Diagrammatic explanation of television; the sequence of action begins at the lower left.

scanning beam and carried in sequence over a signal beam which is telecast to the "mind" or picture tube. These signals are re-created on the end surface of the picture tube as the original scene "observed" by the television camera.

Scientifically, television cannot be described except electronically. It is a mechanical-electrical means of converting light patterns into electric impulses and then into light patterns. These changes must occur so rapidly and so continuously that the human eye continues to see after all of them have taken place.

As in the motion-picture film, so in television; a scene appears, disappears, and is replaced by another still scene many times each second. Thirty complete images appear on the camera plate, and therefore on the kinescope tube, every second; this is rapid enough to give the viewer a mental impression of motion. (See persistence of retinal impression, page 410.)

How pictures are televised is shown in the schematic drawing in Fig. 14.4, which shows a television camera, amplifier, transmitter tower, antenna, and picture tube or kinescope.

Sound and pictures are sent over the air simultaneously by means of radio. A camera tube records light patterns and changes them into electrical impulses by means of a plate (*P*) which, covered with hundreds of tiny chemical eyes, is very sensitive to light. The lens of the camera focuses the picture to be televised onto the surface of the plate. Since all the picture images are combinations of lighter and darker areas, the plate changes the light striking its surface into corresponding electrical charges, which are then sent to the target (*T*).

The charges are swept off the target in single file by a scanning or "sweeping" beam (*EB*); hence the whole picture is not sent out or telecast at once. Rather, the beam sweeps back and forth across the target and travels in an interrupted descending path from top to bottom of it, creating a continuous signal or message. The scanning beam sweeps the signals at the rate of 4,000,000 per second, fast enough for 30 complete images to be swept from the camera target every second. This signal is then strengthened or amplified (*AMP*) and transmitted into space.

The reverse process occurs in the picture tube or kinescope (*K*). When the signals are intercepted by the receiving antenna they are led to a receiver (*REC*), where they are selected or tuned, amplified (*AMP*), and then led to the small end of the kinescope. In the same order in which these charges were swept off the camera target, they are instantaneously scanned or sprayed onto the inside surface of the large flat end of the kinescope. This end of the tube is coated with a chemical like that used in fluorescent lights, which is sensitive to electrical charges. As the electrical energy variations are "sprayed" against the kinescope, they are transformed into light that varies in proportion to the strength of the corresponding charges. Since these electrical charges strike the kinescope screen in the same order as that in which

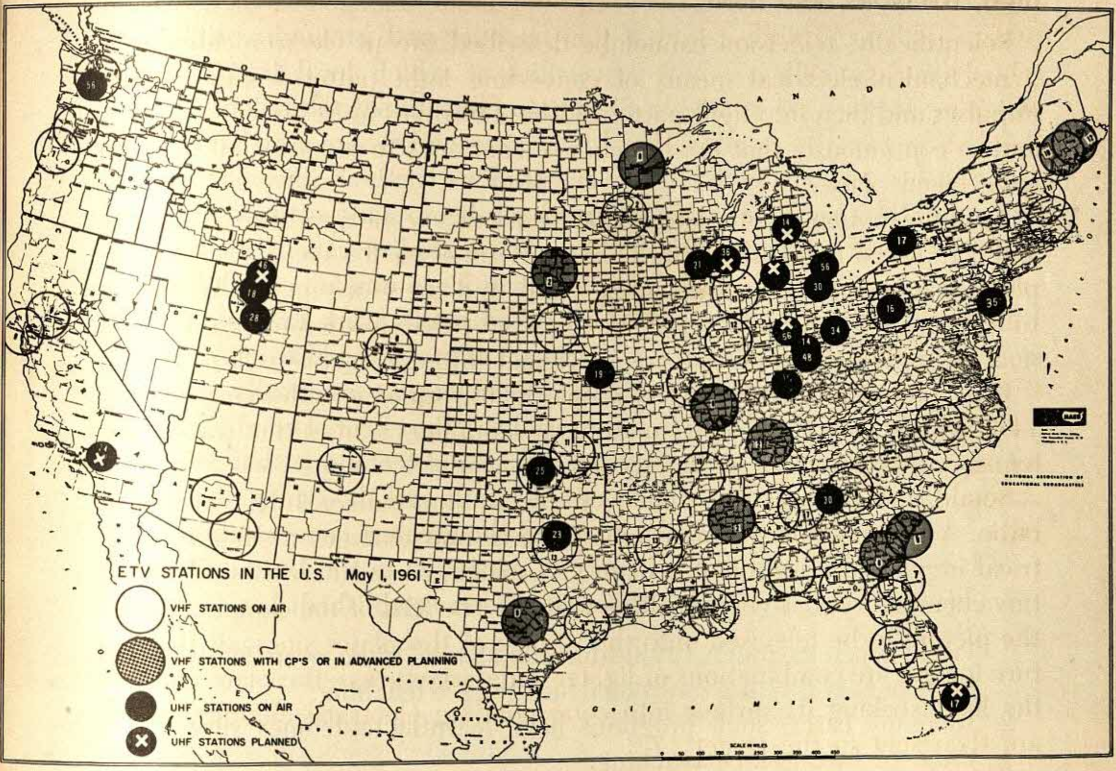

DOMINION OF CANADA
ETV STATIONS IN THE U.S. May 1, 1961
VHF STATIONS ON AIR
VHF STATIONS WITH CP'S OR IN ADVANCED PLANNING
UHF STATIONS ON AIR
UHF STATIONS PLANNED
Gulf of Mexico
SCALE IN MILES
NATIONAL ASSOCIATION OF EDUCATIONAL BROADCASTERS

Fig. 14.5. Over 70 parent and satellite stations are now telecasting regularly scheduled programs over channels set aside for educational television.

they were swept off the camera target, an identical picture image is reproduced. This process occurs at the same rate—4,000,000 impulses and 30 complete pictures per second.

TELEVISION AS A MEANS OF INSTRUCTION

The first channel for educational television use was assigned to Houston, Texas, by the Federal Communications Commission in 1952. Before that, many schools, colleges, and universities had begun to experiment with programs produced and broadcast by local commercial stations, or even closed-circuit lines between classrooms.

Since the opening of the first educational television at Houston, more than 70 stations have gone on the air, and others are in the process of arranging for channels, equipment, and staff personnel. (See Fig. 14.5.)

The single most important factor in this development and growth has been the National Educational Television and Radio Center, which, with "pump-priming" funds from the Ford Foundation, has guided the expenditure of millions of dollars into station facilities and program activities in school districts, colleges, and universities at which local initiative and matching funds were available to initiate educational television.[1]

Just how effective is educational television, and where is it likely to be of the greatest service in the improvement of instruction? Since about 1955, well over 1000 separate investigations have been made of how it can be used in current educational situations. These studies vary: Can spelling, art, science, social studies, etc., be taught to large numbers of children as well as in traditional classrooms? Can gifted pupils work effectively at an accelerated rate when television is the means of providing instruction? These studies have been carried on in almost all subjects at practically all levels, from kindergarten to college; in some instances, the effect of combining educational television with other traditional teaching techniques has also been studied. In all, hundreds of thousands of pupils and thousands of teachers have been involved in what may be called the greatest concentration of research ever undertaken in the history of education in the United States.

In general, such results as these have been established:

1. Pupils learn as much from educational television, even in its initial form, as they do from traditional face-to-face teaching.
2. In many cases, such programs have learning outcomes superior to those of face-to-face teaching.
3. Gifted pupils benefit uniquely, especially because they can do advanced work beyond what is usually available to them in their own classrooms.
4. The courses can draw upon many audiovisual teaching materials and techniques usually not available to the classroom teacher.
5. Educational television provides a high-level teaching-learning experience, often for the first time, in areas where such teaching is not provided by the local school district because teachers are not available or the budget is limited.

When we consider that all this is the result of only ten years of use of and research on a new medium, we realize the tremendous opportunities ahead. In the words of a midwestern educational television director: "Never have so many educators worked so hard during a ten-year period to master a new educational technique. Ten years ago there were no TV experts; just teachers, audiovisual personnel, educational radio personnel, and professional educators, eager and willing to work at and learn about the educational TV medium."

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[1] Among outstanding TV programs initially produced by National Educational Television are *The Red Myth, Shakespeare, A Modern Dance Series, Discussions with World Leaders, Great Plays of Ibsen, Goldsmith,* etc. Also to its credit is "intertel," which provides for exchanging programs with Australia, Great Britain, and Canada.

What is remarkable is such exciting developments as the more than 70 community and regional broadcast stations now on the air, the closed-circuit television classroom teaching project at Hagerstown, Maryland, and the Midwest Program of Airborne Television Instruction, among others.

SCHOOL-PLANNED AND -CREATED TELEVISION INSTRUCTION

Television for classroom use is a reality today in almost all the large metropolitan areas of the United States. Financed partly through grants-in-aid from foundations, government, or local community organizations, scheduled school television programs supplement or in some cases take the place of regular classroom teaching.

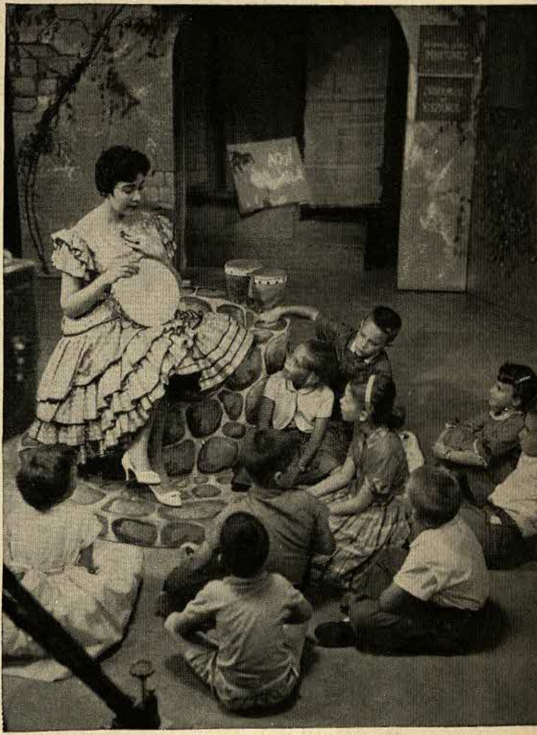


Fig. 14.6. This lesson in Spanish represents the efforts of a team of co-workers. It is now possible to bring expert teaching, the creative leadership of skilled TV direction, and modern cross-media teaching techniques into coordinated interaction. What advantages does this provide for the classroom?

Programing and production in the public schools of Seattle and King County, Washington, are the result of careful planning by members of the County Curriculum Committee, an advisory board whose members represent educational and lay groups, and the production staff of the educational television station, all of whom are under the direction of a group of television consultants, coordinators, and supervisors. The program for a given semester is as broad as the curriculum and is representative of most grade levels. Programs are offered in arithmetic and mathematics, the sciences, language arts, social studies, home economics, modern languages, etc. (Fig. 14.6).

Similar program planning and production are now being carried forward in San Francisco, Salt Lake City, Denver, Dallas, St. Louis, Chicago, Cincinnati, Pittsburgh, Philadelphia, Atlanta, Tampa, San Juan, Louisville, and Milwaukee, among others (see Fig. 14.5).

Fig. 14.7. How does the television teacher teach? At Hagerstown, each such teacher has a private office in which he plans and creates demonstrations. He also spends hours in rehearsal to make sure the sequence is logical, the demonstrations are correct, and understanding "comes through." All this precedes the 20- or 30-minute lesson. To what evaluation is the television teacher subject?

CLASSROOM-COORDINATED TELEVISION INSTRUCTION

Hagerstown, Maryland, is representative of research on television and its development on a county-wide basis. Although the actual programs are closed circuit (a coaxial cable is used), the central programing makes possible the same results in many outlying schools as if the telecasts were open circuit.

The first step in television at Hagerstown involves cooperative decision by classroom and television teachers regarding the grade levels and subject areas to which television can make its best contribution. In other words, in what situations can educational television offer learning experiences beyond those possible with the routine "day-in" "day-out" classroom teaching?

It is recognized that the classroom teacher has recognized strengths that stem from face-to-face classroom teaching. So also, the television teacher has unique strengths that stem from his ability to arrange highly complex, necessary demonstrations which call for hours of planning and for learning materials usually not available to the classroom teacher. When both the classroom teacher and the television teacher bring their unique skills to the classroom, the pupils' learning goals will be achieved in a more efficient manner. The reason for this will be apparent if the role of both in the Hagerstown situation is made clear.

Like the classroom teacher, the television teacher is chosen for professional

reasons. He is an outstanding, professionally trained teacher who can meet the demanding tasks of teaching on television. He may teach only one twenty-minute lesson each school day, but he usually spends from eight to twelve hours per day in preparation. This involves planning content and the sequence in which concepts are presented; selecting film clips, slides, models, and charts for a lesson; working with staff artists on original models, specimens, charts, or diagrams which are not available commercially; rehearsing with the television director, sound engineers, cameramen, etc.; and finally, preparing mimeograph study helps which are distributed to the several thousand pupils who watch the lesson on the air. A television teacher usually has to work closely with as many as twenty or more television production personnel before a broadcast (see Fig. 14.7).

In Hagerstown, the classroom teacher may be one of the many teachers in neighboring communities who are getting ready to watch an identical 20-

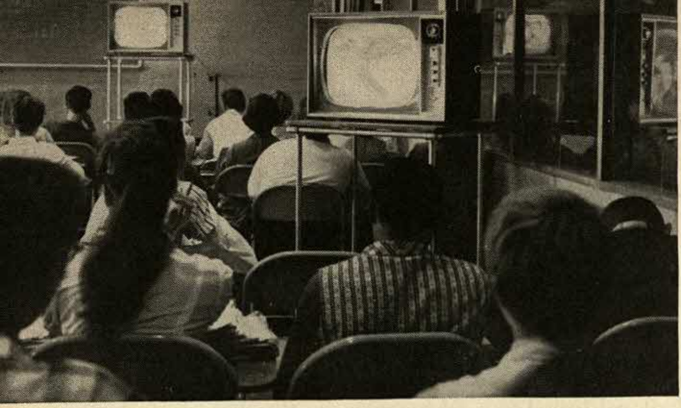
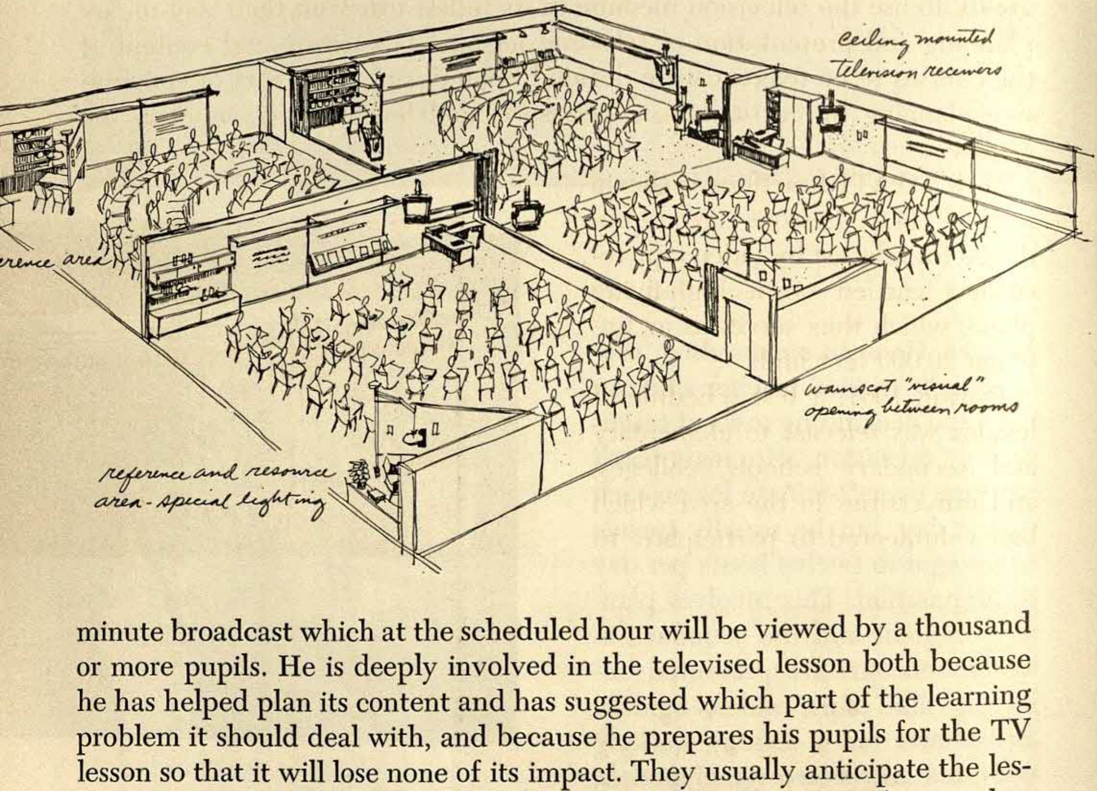


Fig. 14.8. Classroom arrangements for televiewing must insure that every pupil can see and hear. How this is handled at Hagerstown is shown in the photograph above. How this might be improved is shown in the sketch. What is your opinion? Can you identify strengths or possible limitations?


Ceiling mounted Television receivers
rence area
wainscot "visual" opening between rooms
reference and resource area - special lighting

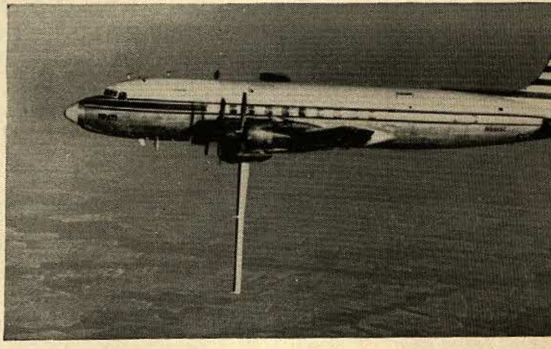
minute broadcast which at the scheduled hour will be viewed by a thousand or more pupils. He is deeply involved in the televised lesson both because he has helped plan its content and has suggested which part of the learning problem it should deal with, and because he prepares his pupils for the TV lesson so that it will lose none of its impact. They usually anticipate the lesson by reading, discussion, and pupil-teacher planning. The television lesson begins, and the TV teacher enters the classroom via the screen to join forces with the classroom teacher. It is when the two function as a team which uses this coordinated approach to improving instruction that educational television achieves efficiency. That such efficiency is being approached at Hagerstown is revealed in constant evaluation by classroom teachers, TV programers, and pupils. The physical setting for classroom TV at Hagerstown is shown in Fig. 14.8.

REGIONAL TELEVISION INSTRUCTION

Another application of educational television on a broad regional basis is found in the Midwest Program on Airborne Television Instruction (MPATI). On a budget of nearly $8 million provided by the Ford Foundation and private industry, MPATI brings television learning experiences to an estimated 5,000,000 pupils and their 200,000 teachers, regardless of where they live in parts of the six states now covered. The lessons are taught by nearly 300 teachers, most of them "veterans" of previous television teaching projects throughout the United States. These teachers were selected by a screening panel of midwestern educators on the basis of their ability to use the television medium to its fullest extent in their day-to-day planning and presentation of televised lessons. The nature and content of the courses to be telecast were decided upon during two years of cooperative planning by curriculum, supervisory, and teaching personnel in the Midwest.

How MPATI functions is shown in Fig. 14.9. Lessons are reproduced for telecast by video tape recorders carried on a high-flying plane, which thus serves as an antenna 20,000 feet high.

During 1961, a test schedule of lessons was telecast to elementary and secondary schools, colleges, and universities in the area which had volunteered to participate. In



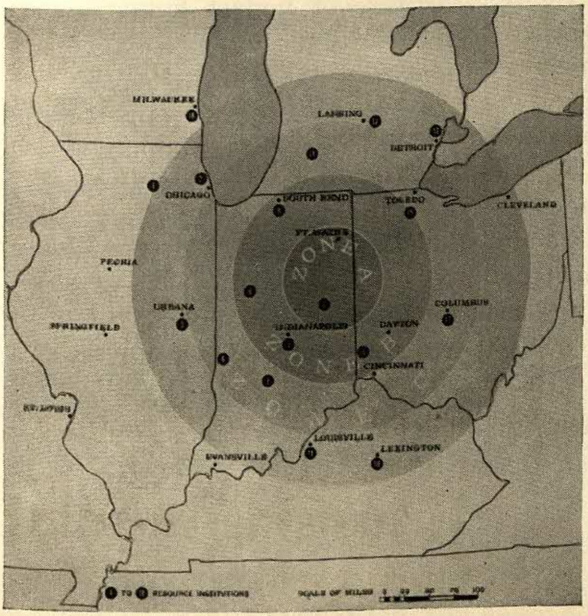


Fig. 14.9. The MPATI plane circles at 20,000 feet to serve as a broadcast tower for TV lessons that are "played" by video tape recorders on the plane. The area served is shown on the map. What problems does MPATI solve? What ones does it create?

WEDNESDAY	
Russian (4)	Frontiers of Science or Math (3)
General Science (4) Junior High	Physics (4) MIT
Arithmetic (2) Grade 3	Arithmetic (2) Grade 6
French or Spanish 1 Junior High (4)	Advanced Foreign Language H.S. (4)
Music (2) Grades 1–3	Music (2) Grades 4–6
Guidance (1) Senior High	Int. Relations (4) Area Study
Social Studies (2) Grades 1–3	Arithmetic (2) Gifted Children
Language Arts (4) Grades 3–4	Language Arts (4) Grades 5–6
Humanities (3) repeat	Guidance (1) Senior High repeat
Government—Civics Grades 8–12 (4)	Int. Relations (4) Area Study repeat
Science (5) Continental Classroom	Mathematics for (1) Teachers H.S. repeat
General Science (4) Junior High repeat	Humanities (2) Great Books
Art (2) Grades 1–3 repeat	Art (2) Grades 4–6 repeat
Science (2) Grades 1–2	Social Studies (4) Grades 4–6
French (4) Grades 3–6	Spanish (4) Grades 3–6
Science (4) Grades 3–4	Science (4) Grades 5–6

Fig. 14.10. A day's representative MPATI broadcast schedule. (Numbers in parentheses indicate frequency per week.) What is your reaction to such a schedule?

the fall of 1961, a complete and comprehensive schedule was begun which included such courses as those listed in Fig. 14.10.

MPATI has purposes similar to those sought at Hagerstown, namely, to bring carefully planned, difficult-to-teach areas of the curriculum into any classroom through the means of educational television. It offers such advantages as expert teachers, access to both existing and specially created teaching materials, economy of time in presenting difficult but needed demonstrations—all designed to enrich and supplement the work of the local teacher. In some cases it makes available complete higher-level learning experiences to gifted and accelerated pupils in schools which cannot afford teachers or facilities for such purposes.

Another important outcome is the fact that MPATI can provide high-level instruction in subjects not now offered in certain localities because of budget limitations or the lack of teachers or instructional facilities. As such, MPATI is upgrading educational opportunity; and as its program continues, it will open the way for other regional—and ultimately, world-wide—planning and use of educational television. (See Fig. 14.11.)

TOTAL INSTRUCTION VIA TELEVISION

Another important development in the use of educational television has occurred at the City Junior College in Chicago. Those who are enrolled in the Chicago Junior College

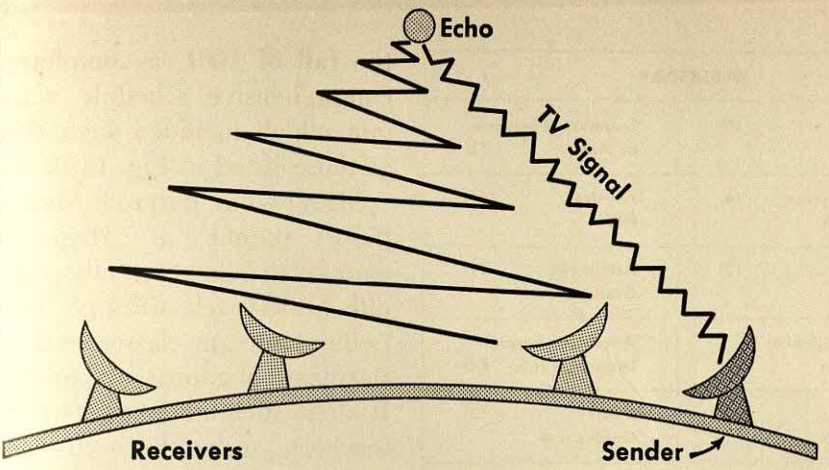


Fig. 14.11. Man now has the technical knowledge with which to make world-wide television a reality. This is how television signals might be bounced to and reflected from satellites in various locations around the earth.

receive all their instruction via television. The method of preparing lessons is similar to that described earlier. However, no classroom teacher participates; instead, the student receives instruction from the television teacher alone. Related activities include assigned reading and the preparation of written assignments; but even here there is no classroom teacher.

Several years of experimental work have established that students who are compatible with television instruction are superior in accomplishment. In 32 test uses of television instruction in junior college English, social studies, sciences, and psychology and the humanities, the data showed that in 17 cases television instruction had as good results as face-to-face instruction did; in 11 cases it was superior. In only two cases was classroom instruction superior.[2] Such research points to the possibility that large areas traditionally taught by the classroom teacher will soon be taught more efficiently by educational television.

VIDEO, KINESCOPE, AND TELEFILM RECORDING

A radio program that is worth preserving for reuse can be recorded on tape (see Chapter 11). Similarly, a television program can be preserved by means of a video tape recorder (Fig. 14.12). However, video recorders are very expensive, and hence are usually found only in television broadcasting and production centers. Kinephotography is a more common means of preserving a televised program. It involves making a continuous sound and

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[2] *TV College* (report of a three-year experiment by the Chicago City Junior College), Chicago Board of Education, 1960.

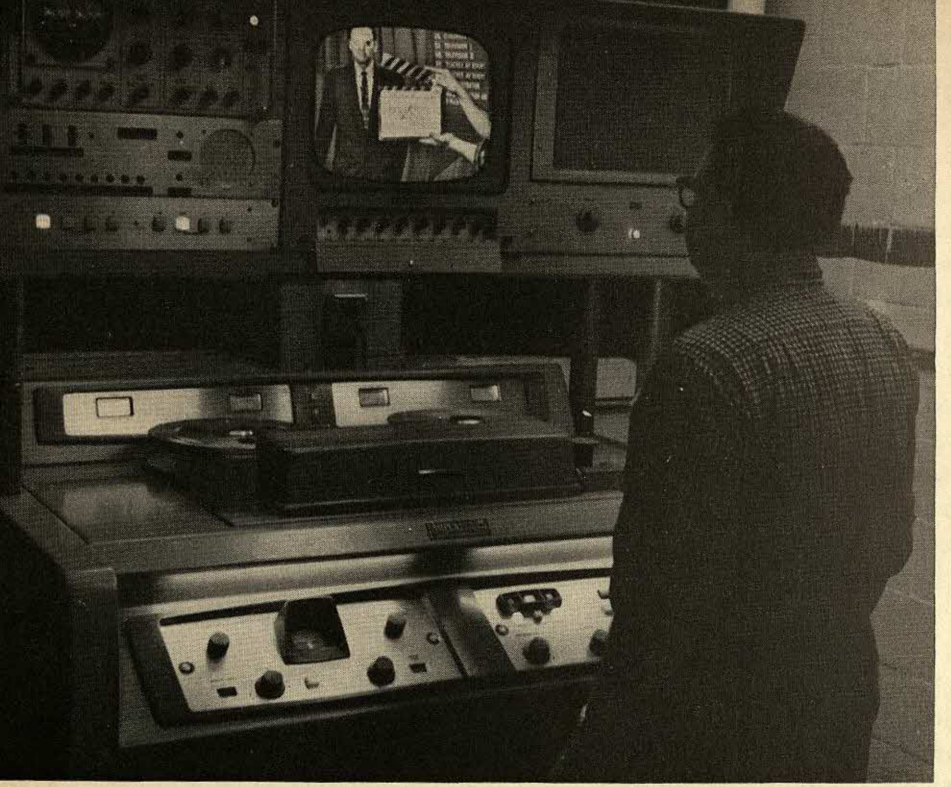

Fig. 14.12. A video recorder and playback, the remarkable instrument that tape records entire TV programs just as an ordinary tape recorder records speech.

motion-picture record of a television show while it is being telecast, or "dubbing" a video recording on to a kinescope. A kinephotographic record of a television program is in essence a sound motion-picture film. The kinescoped television program is a comparative newcomer to the field of audiovisual materials; it should be considered by all teachers, particularly those who teach in areas where there is no television.

A kinescope recording is mounted on a 16mm. motion-picture reel, is 16mm. wide, has a sound track along one edge, and can be projected on a standard 16mm. motion-picture sound projector. It differs only in that it is actually a recording of a live television program. As such, kinescopes are a rich source of supplementary classroom experiences.

One of the first kinescopes available for school use was produced in 1951 during the Kefauver Committee investigation of crime in major American cities. The Kefauver kinescopes are actually documentary film accounts that are highly useful in civics classrooms as background material to the study of court procedures and crime in large cities.

Kinescopes can be obtained from two major sources: (1) as rebroadcasts from educational television stations, and in some cases commercial stations; and (2) by purchase from television or film companies, or by rental from educational motion-picture film libraries.

Recently some of the major producers of educational sound motion-picture films arranged for outstanding television lessons to be "recorded" in a special manner by motion-picture cameras. Some editing can be done following recording, with the result that a high-quality motion-picture record of a television lesson can be produced. Thus, a new type of telefilm recording is available today for classroom use, much as sound-motion-picture films are used. Complete high-school and college courses in chemistry, physics, mathematics, and biology are available on telefilm or, to all practical purposes, 16mm. sound motion-picture films. In other words, there is no need to wait for television facilities and receivers; instead, complete television-originated courses are now being presented in thousands of schools by means of 16mm. sound projectors.

Thus the use of telefilms in a one-year course in physics (see Fig. 13.27) makes it possible for a master teacher to meet each day with a group of pupils in a school that has never been able to find a teacher and cannot afford the facilities needed to teach a given course. Through telefilms, the curriculum in thousands of small or remote high schools and colleges is being enriched or for the first time expanded.[3] Furthermore, as we saw in Chapter 13, research with the White physics films in Wisconsin high schools showed that they were as effective as traditional classroom instruction, and in some situations more effective.

PUBLIC TELEVISION IN THE SCHOOL

When is a television program entertainment? When is a program that has been designed for the general public useful in the classroom?

The greatest single consideration in selecting any instructional material for school use is whether it presents an additional desirable learning experience. This must be determined by those who examine television programs originally produced for other than school use. (See the film selection guide on pages 390–391.)

Many valuable programs are televised during extra-school hours. If the teacher makes it his responsibility to know about them in advance by consulting the TV programs listed in the newspaper or other publications, if he recommends programs which are useful in connection with the subject currently being studied, he can enrich a given classroom situation and provide his pupils with added experience with their world. In many cases the sponsors of such telecasts have study materials that are available to teachers on request. Furthermore, encouraging pupils to view these extra-school telecasts creates an opportunity for the improvement of home viewing standards.

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[3] The EBF telefilms in physics, chemistry, and mathematics can be purchased or rented from most state or regional film libraries.

Telecast weather reports are verbal explanations supported by weather charts showing thermal zones, storm fronts, isobars, and pressure zones. What better demonstration is available for science classes studying the atmosphere and weather?

Telecasts of classical and contemporary music, during which the cameras move around above the various performers, allow the viewer to watch the fingers of the first violinist, observe the trumpeter as he delicately fingers the keys of his instrument, watch the tympanist produce a crashing crescendo. Is this an experience for adults only? Or is it a model of hoped-for attainment to be shown to instrumental music classes in the junior high school?

The wealth of current events telecasts is beyond description—Congress in session, United Nations proceedings, the city fathers in action, and illustrated reports by the sanitary engineer, the superintendent of water supply, and public works construction engineers. All of these should be scrutinized by the history and social studies teacher who seeks to relate contemporary living with the individual student's understanding of his role in society.

The existing general television programs, if carefully selected for their ability to bring added and desirable experiences into learning situations, represent a valuable entry to the field of educational television for those who are interested in the possibility of improving instruction through this medium and who have access to television receivers that are large enough to permit good viewing in the classroom.

CLASSROOM USE OF TELEVISION, KINESCOPES, AND TELEFILMS

The use of television, kinescopes, and telefilms in the classroom closely parallels the use of the sound motion-picture film. Nevertheless, there are certain factors that should be considered, particularly in the case of television programs.

TECHNIQUES FOR SELECTION

The selection of a telecast, kinescope or telefilm suitable for instructional use is similar to the process of evaluating and selecting sound motion-picture films for the classroom.

As in selecting any audiovisual material of instruction, the basic question is whether the telecast, kinescope, or telefilm makes a contribution to the learning situation beyond that made by instructional materials already in use.

A unique problem that confronts the teacher in evaluating and selecting a telecast is the impossibility of preview. Therefore, judgment must be based to a great extent on previous experience with the program. The reputation of the sponsor or producer, the caliber of the expert, authority, or demonstrator who appears on the program, the care taken in organizing the telecast—all help the teacher decide regarding the probable usefulness of current telecasts and those that may be produced in the future. In general, the reputation of the producer and participants will be of continuing importance in this connection.

The same considerations regarding curriculum validity and suitability for the grade level apply as surely to telecasts, kinescopes, and telefilms as to other audiovisual materials: (1) Is the general level of the program keyed to the age of the group that will see it? (2) Is the content of the telecast of such a nature that it will make for better understanding of the subject? Does the program include useful supplements to the unit of work or the general curriculum area? (Here again, inability to preview necessitates the teacher's knowing the general purposes and content of the television program.)

Finally, the quality of the telecast itself must be evaluated. For example, is the program of high quality? Here also, as the teacher becomes increasingly expert in making judgments about the quality of all kinds of instructional materials, this knowledge will enable him to make sounder judgments of television programs.

THE WISE USE OF TELECASTS

The teacher's responsibility in planning for a telecast in the classroom is closely allied to his responsibilities in planning to use other audiovisual materials such as filmstrips, sound motion-picture films, transcriptions, radio broadcasts, etc.

Before the telecast, the teacher should provide activities which will heighten the pupils' interest, which will motivate. The class should be encouraged to talk about the program and to recognize purposes for seeing it. They will soon realize their responsibility for following up a television program by applying what they have seen to the whole range of school activities.

The teacher's greatest difficulty in planning to use television programs is, of course, the inability to know the exact content of a program. This will always be true of telecasts of "live" programs. Kinescopes and telefilms, however, can be previewed.

IMPROVING HOME TELEVIEWING STANDARDS

Parents express both acclaim and concern over the television-viewing habits of their children. The figures cited earlier in this chapter reveal that school children often spend from 13 to 20 hours a week in front of the home television screen—nearly as many as the 25 hours normally spent each week in classroom work. This situation is no longer the exception; rather it is the rule as more and more families acquire television receivers (Fig. 14.13).

"What can I do to get my children away from watching television so much?" a parent asks.

"What can we do to get our children to use better judgment in selecting programs?" another says.

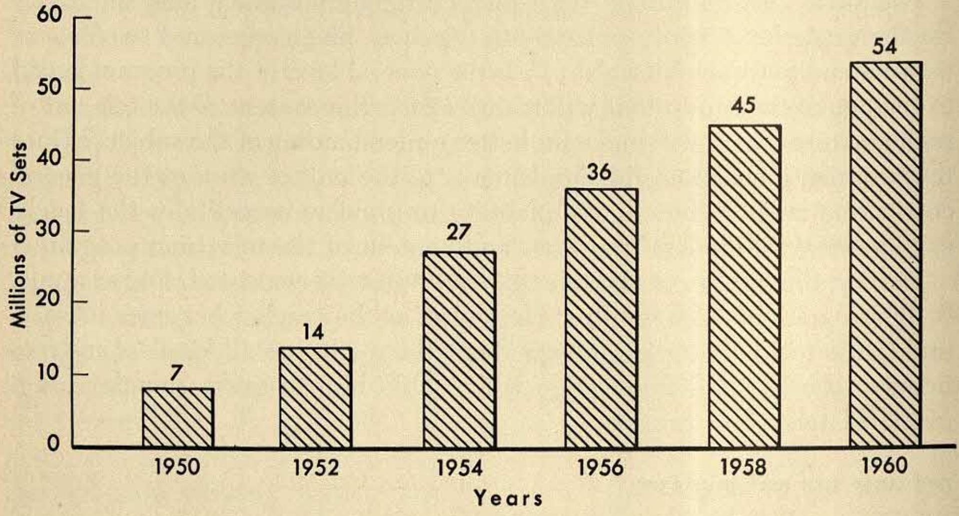


Fig. 14.13. Number of household units having television receivers in the United States.

Any part of our everyday life which is as important as home television viewing deserves to become part of the school language arts program. Classroom activities should include discussion of the subject and of techniques for selecting better programs. The question of what is best will be interesting.

Typical class discussions about television will establish the frequency with which pupils watch such programs as *Gunsmoke* and *The Real McCoys.* The wise teacher through discussion and counseling will help upgrade the group's viewing habits from their present standard. Another topic for discussion is the benefits to be gained from television. Certainly fun and having a good time should be included. But there are other factors that, when discussed and understood, will influence students toward spending fewer hours watching television and toward seeing the more worthwhile programs listed in the local newspaper.

An evaluation sheet such as the following can be used for beginning judgments about home television viewing. Later the class may wish to devise their own.

Name of program .... Network .... Time ....

My estimate: Excellent ____|____|____|____|____|____|____|____ Poor

1. Was the television story worthwhile? ....

   ....

   ....

2. Did the television program contain information which will help me in my daily living? ....

   ....

3. Did the television program present information which will help me in my school work? ....

   ....

4. Was the television program well presented? Was it well organized? Did it represent clean fun? Did it present desirable speech and action, etc.? ....

   ....

   ....

5. Was the acting well done? ....

   ....

6. Was the program clear-cut, vivid, and well defined as it came through on my receiver? ....

   ....

7. Were the costuming and scenery well done? ....

   ....

Study of local television program schedules will show that although most programs are sponsored, others are broadcast by the station as its own contribution to good entertainment. Usually these sustaining programs are of high quality.

SUMMARY

Television has had a remarkable growth. From a small number of experimental sets owned in 1946, the year 1960 saw receivers installed in 54,000,000 homes. However, this constituted less than 30 percent of the land area of the United States, for vast portions of the country were still without television facilities.

Today more than 70 educational television stations are producing classroom programs. Most of them include the individual classroom teacher as a member of the educational television-classroom teaching team.

Educational telecasts currently are available in four main forms. These are the complete teaching sequence provided in the Chicago Junior College; the classroom-coordinated program like that at Hagerstown, and those produced by MPATI and over 70 educational television centers; commercial programs that are of value educationally and are selected and recommended by classroom teachers who wish their pupils to see out-of-school special events programs; and special programs that are recorded by video, kinescope, or telefilm.

In using educational television in the classroom, the teacher accepts responsibilities that are very similar to those assumed in any work-study situation. In addition, he may become important as a leader in assisting his pupils not only to use educational television effectively but to select and view the best of the extra-school programs from among those that flood the home in the afternoons and evenings.

As is the case with all communication media, the school has great responsibilities in selecting and using telecasts; in providing the necessary equipment so that television programs can become an inherent part of classroom instruction; in producing television programs prepared by school people, about school subjects, for school use; and finally in instilling better televiewing habits in school children.

Suggested Activities

1. As an individual student or a member of a committee, conduct interviews or a questionnaire study among the students of a local grade school. Obtain information such as the following:
    a. Number of children whose families own television sets.
    b. Time spent each day or each week in televiewing.
    c. Time spent in listening to the radio before and after the family had the television set.
    d. Time spent in reading before and after the television set was installed.
    e. Time spent in going to the movies before and after the television set was installed.
    f. Television programs most frequently watched.
    g. Programs which are forbidden by parents.
    h. Programs which are encouraged by parents.
    i. Changes in sleeping habits since the family bought the television set.

    Prepare a report on your investigation and discuss the implications of your findings. Repeat the study with high-school pupils.
2. Visit the nearest commercial or school telecasting station. Investigate such factors as:
    a. Methods of producing or selecting television programs.
    b. Attitude of program manager toward school telecasting.
    c. Nature of the audience.

   - d. Studio facilities.
   - e. Physics of telecasting.
3. Visit a classroom in which television is used. Note such aspects of the program being televised as:
   - a. Preparation prior to televiewing.
   - b. The fixing of pupil goals.
   - c. Removal of barriers to understanding the program.
   - d. Follow-up discussion and evaluation.
   - e. Follow-up activities.
   - f. Effect on pupil interest and initiative.
4. During a one-week period, watch your home television set as much as possible. Use the evaluation score sheet on page 000. Prepare a summary of your monitoring activities and discuss its implications for:
   - a. The home viewing habits of children.
   - b. The effect of home viewing on patterns of behavior.
   - c. The effect of home viewing on school relationships.
   - d. The possibility of using selected commercial programs in improving classroom instruction.
5. Arrange to view kinescope recordings of television broadcasts or telefilms. Report your reactions to the class.
6. View such a film as *The Second Classroom* (Sound, B&W, 28 min., NEA, DAVI), and any others you can locate on the subject. Report on how such films can be used to understand the techniques of telecasting the use of television in the classroom. On the basis of your knowledge of existing telecasts, select a television program which you believe will enrich classroom learning, and prepare a study plan for its use.
7. Make a simple diagrammatic layout that will permit a typical group of children to watch television in the classroom effectively. Specify the kind of set and indicate the location of equipment, etc., so as to visualize the classroom layout.

Bibliography

Brish, William (ed.), *Closed-Circuit Television—Teaching in Washington County*, Hagerstown, Maryland.

Chinn, Howard, *Television Broadcasting*, McGraw-Hill, 1953.

Educational Facilities Laboratories, *Design for Educational TV*, Dave Chapman, Inc.

Educational Facilities Laboratories, *Planning for Schools with Television*, Dave Chapman, Inc., 1960.

Himmelweit, H. T., Oppenheim, A. N., and Vince, Pamela, *Television and the Child*, Oxford, 1958.

Lewis, Philip, *Educational Television Guidebook*, McGraw-Hill, 1961.

Midwest Program on Airborne Television Instruction, Purdue University.

Pittsburgh Schools, January–April, 1960.

CHAPTER 15

CROSS-MEDIA USE OF AUDIOVISUAL MATERIALS

THE CROSS-MEDIA USE of audiovisual materials makes it possible to improve learning efficiency by choosing for classroom instruction audiovisual experiences which reinforce one another. A film may be an effective learning experience in itself. A field trip may provide valuable new information for the learner who took it. A map can be a means of becoming acquainted with the world. Books have untold values. When film, field trip, maps, books, etc., are carefully coordinated for classroom use, the learning that results can be much more than the sum of the individual parts.

The preceding chapters have described individually a variety of audiovisual materials and methods. The present chapter will cite several examples of the cross-media use of appropriate materials.

The cross-media approach to classroom instruction places full responsibility on the teacher for analyzing the learning needs of the pupil, for knowing about sources of audiovisual materials from which he can select those which will help satisfy learning needs, and for knowing how to use a cross-media array of materials efficiently so as to achieve the full measure of its learning potential.

IDENTIFYING LEARNING GOALS

Learning problems in the classroom are as broad as the curriculum the school offers. They may be defined in terms of the goals to be achieved. The primary teacher's goals may be to develop number readiness, greater language facility, or increased interest in reading and attainment of reading comprehension. The goal of the social studies teacher may be to impart information about other people—their cultural patterns, their home relationships—or, more important, to establish favorable attitudes toward them.

The means by which teaching goals may be achieved are varied and complex. They may include reading, or actually going to live in the cultural group being studied. Between these two extremes are the audiovisual instruction materials which, because of their interesting and flexible formats, can bring right into our classrooms tangible, real-life information about remote cultures, peoples, places, and things.

SELECTING SUITABLE TEACHING MATERIALS

After the goals of instruction have been defined, the teacher will need to arrange for learning experiences which will be useful in helping his pupils attain these goals.

Teaching materials—field trips, pictures, transcriptions, charts, books, films, slides, etc.—have unique characteristics. Hence, the selection of suitable materials should be based on how well they will help the pupils reach their goals. In Fig. 15.1 are summarized the various characteristics of audiovisual teaching materials that were discussed in earlier chapters, and of programed learning through the use of teaching machines, to be discussed in Chapter 16.

Other factors which must be considered in selecting instructional materials include the following:

	16 mm. Sound Motion-Picture Films	Filmstrips	Slides	Flat Pictures and Tackboard	Posters and Charts	Maps	Chalkboard	Field Trips	Radio	Recordings and Transcriptions	Language Labs and Tape Recorders	Models and Specimens	Television and Kinescopes	Teaching Machines[b]
VISUAL														
Visually re-creates situations involving motion which occur anywhere	X							X				X	X	X
Visually re-creates the past	X	X	X	X	X		X					X	X	X
Visualizes theoretical ideas and microscopic life	X	X	X	X	X		X					X	X	X
Visualizes with natural color	X	X	X	X	X			X				X	X	X
Visualizes natural dimensions (three-dimensional)	X	X	X	X			X	X				X	X	
AUDIO														
Re-creates characteristic or environmental sounds	X	X[a]						X	X	X	X		X	X
Re-creates events through dramatization	X	X[a]							X		X		X	X
UTILIZATION														
Sequence fixed	X	X											X	
Flexible organization permits rearrangement			X	X	X	X	X	X		X	X	X		X
Permits restudy	X	X	X	X	X	X	X	X		X	X	X	X	X
Permits leisurely examination, discussion, etc.		X	X	X	X	X	X	X		X	X	X		X
Control of time and place of use	X	X	X	X	X	X	X	X		X	X	X	X	X
Can usually be produced locally	X	X	X	X	X	X	X	X	X	X	X	X	X	

[a] Sound filmstrips only.

[b] Models in which slides, tapes, filmstrips, motion-picture films, etc., are used.

Fig. 15.1. Contributions of audiovisual instruction materials to learning.

1. Accuracy and authenticity of the information.
2. Suitability for the grade level in terms of vocabulary, pace, and general understandability.
3. Mechanical excellence of sound, vocabulary, color, and other general "see and hear" factors.

Audiovisual materials should be selected or rejected in terms of how well they perform their intended function. The answer to this question will be found in the extent to which the purpose of such materials is clearly indicated.

The following case examples demonstrate some of the ways in which well-selected and carefully used instructional materials can help in achieving good classroom learning.

CASE EXAMPLES

A SOCIAL STUDIES UNIT—HAWAII THE 50TH STATE

With the attainment of statehood by our 50th state, Hawaii, social studies teachers have been faced with the necessity not only of assaying the experience needs of pupils, but of making an inventory of their own information about the new state.

Recently, a teacher reported the following exploratory discussion with social studies pupils:

"We're planning on including the study of our 50th state in our course plans. What are some of the questions you have about Hawaii?"

One pupil immediately asked: "With so many different kinds of people living there, what language do they speak?"

Other pupils volunteered questions about school, recreation, sports, dress, food, and even money and postage stamps. A faculty meeting later in the day disclosed the fact that not even the staff members knew all the answers.

The faculty course committee went to work. They began by setting up learning goals, and investigated the availability of maps (very few were found), filmstrips, films, slide and picture collections, books, etc. Finally, one of the group volunteered to try out the cross-media study plan which is now reported.

TEACHER. We've been studying many countries, their people and activities—let's review what we have done.

JOHN. There was Central Africa, Cuba.

TEACHER. There were other countries . . .

STANLEY. China.

LINDA. South America—Chile, Brazil.

TEACHER. And what kinds of things were we interested in finding out about?

PHILIP. About how children went to school, what they did there.

SHARON. Interesting things about the history of the country.

WILLIAM. What people did for a living, how they earned a living.

LINDA. Their costumes, what they wore.

TEACHER. And probably we'll be just as curious about the next place we study—Hawaii, our 50th state. First, do we already know anything about Hawaii?

PHILIP. It's an island.

GEORGE. It's a group of islands.

STANLEY. They were made by volcanoes; one is still erupting.

SHARON. Long ago Hawaii was just ocean.

TEACHER. Now let's tabulate some of the things we think we know.

(A pupil goes to the chalkboard and records what has been said, and other ideas that come up as the discussion continues; then . . .)

TEACHER. I'm not at all sure all these ideas are correct—first, though, let's add to our list things we'd like to know more about.

JOHN. Do they still use grass huts?

(A lively argument ensues.)

SANDY. What about clothes? I've seen some pictures of people who sure don't dress like we do.

JUNE. What about seasons?

JOHN. Is there summer and winter?

TEACHER. We'll put all this under climate, and . . .

JUNE. Geography—are there rivers and lakes?

TEACHER (*encourages further suggestions and then says*). You sound just like a geography book—climate, history . . . What about children and young people who live there? Don't you have any questions about them?

FRED. Yes—What games and sports do they play?

SANDY. Do they have Girl Scouts?

JOANN. Their food; what do they eat?

(Discussion continues.)

TEACHER (*breaking in*). I'd like to add a few questions of my own. Where did the people who live there today come from? What nationalities are represented, etc.?" (*Adds one or two learning-goal statements from the course guide, but finds that pupil-teacher planning has anticipated almost everything in the guide.*) Now what are some of the ways we have been using to find answers to our questions? In this case, questions about Hawaii.

BRUCE. If we knew of someone who has been there, we could ask them to visit our class and tell us about Hawaii.

LINDA. We can read books about it and then look up things in the encyclopedia.

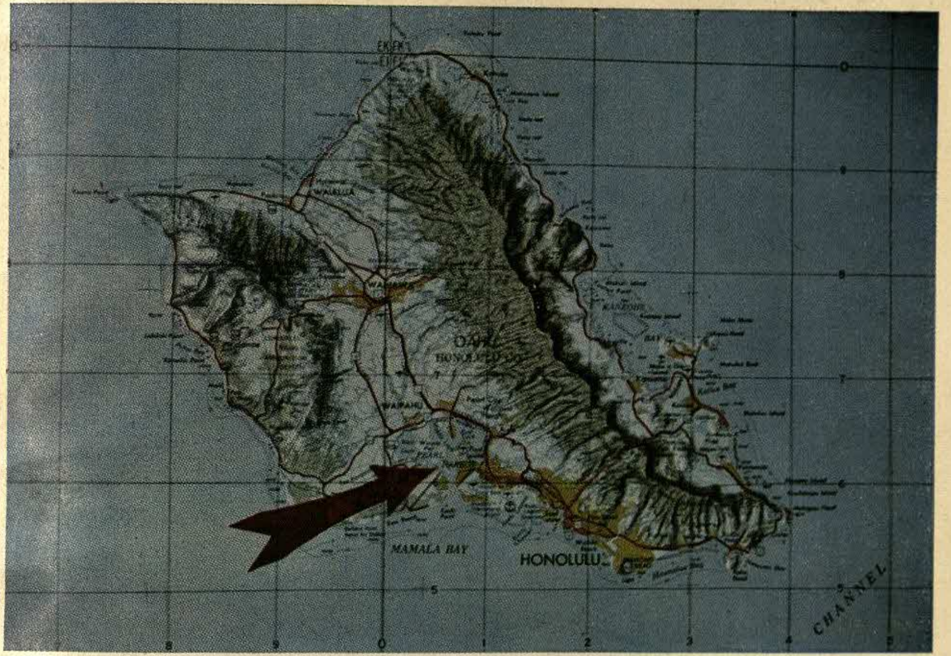
JOHN. Or write to someone who lives in Hawaii.

BRUCE. I know that John D. and his father were in Hawaii last summer. They send for orchids. They had a picnic and cooked a pig under ground. We could get him to come.

CHERYL. I know a girl from Hawaii who goes to the B. School. She has pictures; maybe we could see them.

TEACHER. If we could do anything we wanted to in order to find out about Hawaii, what would you do? . . . Anything . . .

Opposite page: The map may be used to provide initial orientation in understanding our fiftieth state. To understand the many meanings of the symbol locating Honolulu (see arrow), the cross-media use of films, filmstrips such as those shown above, pictures, models, etc., is almost mandatory.



BUREAU OF EDNL. & P
LA

SEVERAL VOICES. Go there, see for ourselves, . . .

TEACHER. We want to be able to do that, but . . . ?

CHERYL. See films about it.

JOHN. And pictures.

TEACHER. Instead of going there, we can bring a good deal of Hawaii right here through our use of pictures, visitors, films, slides, letters, maps; and then later, of course, by reading books which we will bring in from our library. But to begin with, let's go to our map and study the information it presents. [See plate facing page 434.]

(*Discussion continues, with study of the world map for general orientation to the Pacific area, Australasia, and the west coast of the United States and Central America. Next the class studies a smaller but more detailed map of Oahu. The accompanying discussion brings out facts about the location of the island, land elevation, influence of the trade winds, and location of cities and harbors, as all of this probably influences the activities of the people of Oahu.*)

TEACHER (*continues*). I've previewed films and have chosen two which are a good means of getting our first real-life ideas about the people of Hawaii and how they live.

The discussion before the film is shown includes the introduction of the 12-letter Hawaiian alphabet, etc. Questions are formulated based on pupil-teacher planning (see page 395). The classroom is quickly darkened, the projector is made ready for use, and the film[1] is shown, as one component of the work-study situation. (See Fig. 15.2.)

During the discussion that follows, there are still questions about some points, and several pupils volunteer to do simple research during the afternoon library period. The next day the pupils report on such subjects as the racial backgrounds of the people they saw in the film, give chalkboard demonstrations and explanations of the volcanic structure of the islands and the action which caused them to rise above the sea (Fig. 15.3), and present a chalkboard map showing the location, relative size, and unusual names of the seven largest islands.

Further discussion is concerned not only with answers to the general questions raised at the beginning of the unit, but with specific information about surf and water sports, the fish that live in the reefs, the formation of coral shoals, the aging of volcanic rock into soil, etc.

TEACHER. Following your suggestion, we've invited John D. to come to talk to us next week and to show us some slides he took during his visit to Hawaii last summer. In the meantime, I have secured some filmstrips about Hawaii, and we'll look at them. . . . Here, Joan, will you and George get them ready?

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[1] *Hawaii, an Island State,* Sound, Color, 18 min., United World Films.

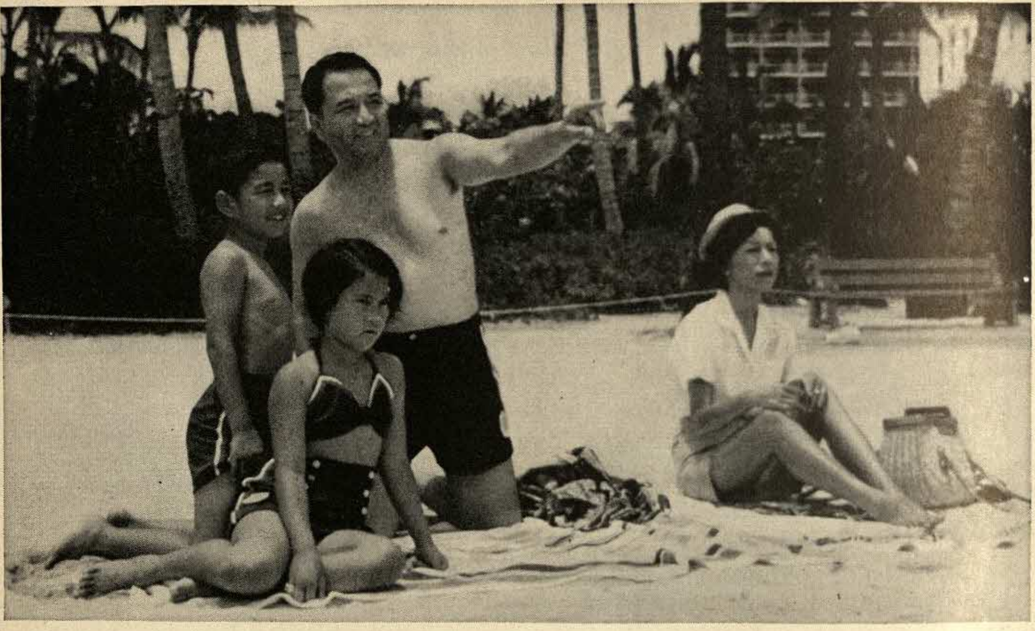

Fig. 15.2. This 16mm. motion picture all but takes the viewer to our 50th state. How does this kind of experience affect map study?

The filmstrips[2] are projected (see plate facing page 434), and the accompanying narration is read. After the showing, the class has questions and there is discussion. One pupil suggests that because Hawaii is in the news and there are pictures of it in many magazines, a study display should be planned. Several pupils volunteer to "screen" the pictures which members of the class will bring in, and to make a work-type display of the best ones.

Library periods are taken up with research on Hawaii. Pupils report their findings and make interesting oral reports. Facts are presented in the form of charts, graphs, or diagrams as in the case of Oahu's artesian water supply fed by 250 inches of rain that falls annually on the mountain ranges to windward.

Once again, the letter-writing idea comes up. Planning continues, and it is proposed that preliminary letters be written but that a final composite letter be tape recorded and mailed to an Island school. This is done.

Along with all these cross-media experiences, reading has proceeded at a gratifying rate. Almost every pupil has participated in at least some of the activities—reporting, preparing displays or diagrams, collecting specimens, etc. As each new project takes form, committees are appointed which include most all the class. As progress continues, the teacher's initial leader-

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[2] *Hawaii,* filmstrip set, 315 frames, Color, Visual Education Consultants.

ship is replaced to a large degree by the pupils' participation in terms of their own interests as they search for information, read, and report to the class.

The cross-media approach to instruction is a means of coordinating many avenues of audiovisual experience so that sought-after goals can be clearly comprehended and eventually achieved.

A TEEN-AGE UNIT—ABOUT TRAFFIC SAFETY

The Problems of Democracy class had an approximately equal number of boys and girls. Since the course was an elective, both juniors and seniors were enrolled. Many had completed courses in American history and civics, and were now approaching the unit on traffic safety, having previously done work in housing, labor-management relationships, and price control.

The social studies teacher wrote the unit title on the chalkboard—Operation Safety—then turned to the class, paused a moment to be sure of the group's attention, and began with slow emphasis:

TEACHER. What can be done to end needless loss of life?

In the less than 24-hour attack on Pearl Harbor, 3800 Americans were killed. In the Korean conflict, 32,000 of our men were destroyed.

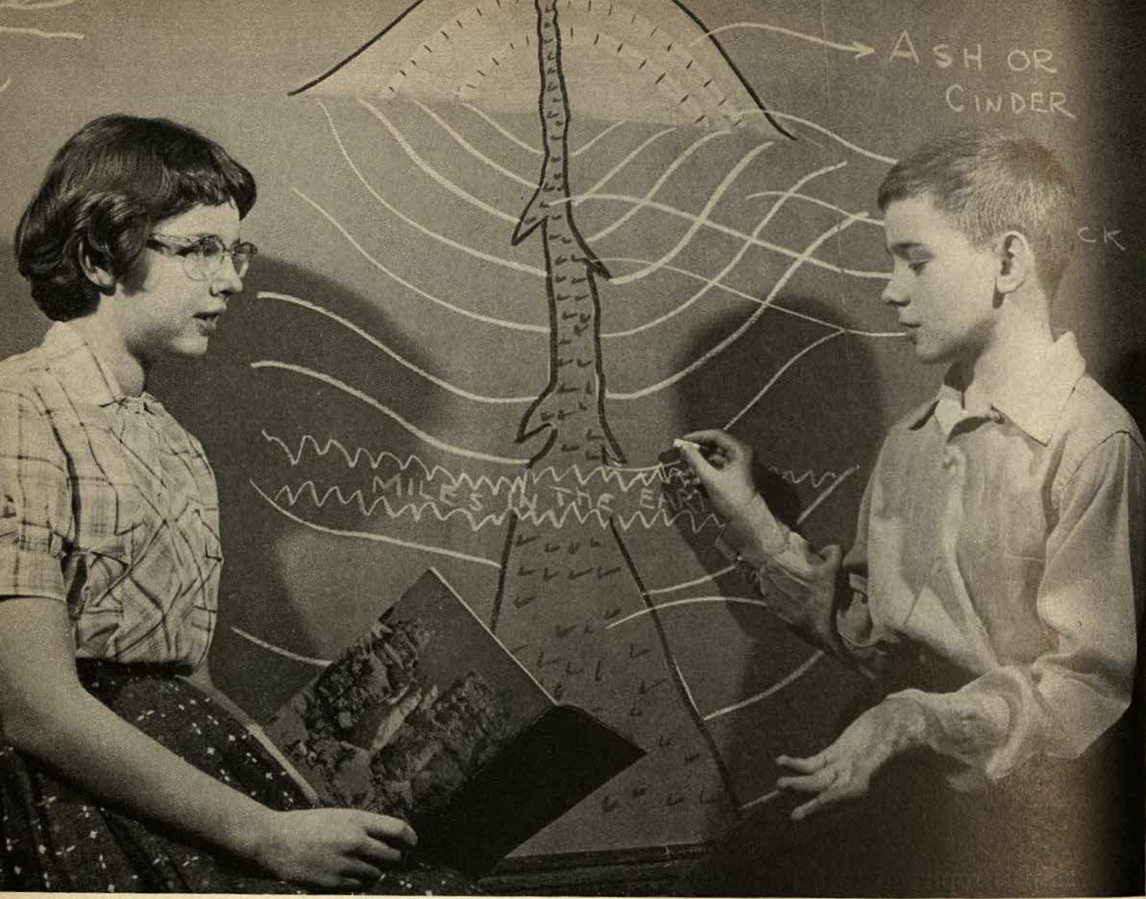

Fig. 15.3. What evaluation function does the chalkboard serve in this situation?

But during *each year* of World War II more than 38,000 Americans were killed, and nearly one million injured, not in war but in *traffic accidents.*

More of our people have been killed by automobiles than have been destroyed in all the wars in which we have fought. It is not war, not the atom or the H-bomb, but the automobile that is the dread killer of today! The automobile is usually considered a very necessary part of life by youth today; to live without a car would be unthinkable. It is a phenomenon of the twentieth century, however, and should be explained as such. The automobile should be understood as a mechanical marvel, as a means of individually controlled transportation, but also as *a potential means of destruction both* of the individual and of others.

The following are suggested as objectives of a study of traffic safety:

1. To understand the fact of the automobile, its history and place in American life.
2. To understand the amount of human destruction due to traffic accidents.
3. To awaken a sense of moral responsibility in the high-school pupil as the driver of a car, or a passenger or pedestrian.

I'd like to read to you several newspaper clippings I have gathered during the last two weeks.

AREA YOUTH KILLED IN TRAFFIC COLLISION

Friday. Three persons were hurt and one killed at the intersection of Highways 51 and 31 Thurday night during a drizzling rain that made highways extremely slippery. Raymond ______, age 17, was killed immediately when two speeding cars collided at the intersection. Witnesses reported both cars approached the intersection at excessive rates of speed.

THIRTEEN KILLED IN STATE: 21 INJURED

Sunday. The state holiday toll, still incomplete, brings to 13 the number of holiday week-end highway traffic fatalities. With 12 hours yet to be reported for the three-day holiday week end, state traffic deaths and injuries promise to reach an all-time record. The worst county accident reported involved a teen-age driver and passengers. Alfred ______, age 19, and Carolyn ______, age 17, were killed Saturday afternoon when their car went out of control, left the road and crashed head-on into a power tower 20 yards from the highway. Seriously injured in the same accident were . . .

NATION'S HIGHWAY TOLL EXCEEDS ESTIMATE: MAY HIT 520 IN 72-HOUR WEEK END

Monday. The long holiday week end drew to a close at midnight Sunday with the prospect that last week's estimated 520 traffic deaths would be exceeded. In a pre-holiday forecast, over 420 persons were expected to die as a result of traffic mishaps—220 in traffic collisions, 120 in accidents caused by speeding or loss of control of the car. . . .

FOUR KILLED IN AUTO MISHAPS: COUNTY TOLL CLIMBS TO 17

Saturday. ______ County's auto death toll stood at 17 Monday—four above last year's figure—following five accidents in which four persons were killed and 11 injured.

Well, what have you to say? (*There is a full minute of silence; the teacher waits quietly.*)

HUGH. It's plenty bad! (*More silence.*)

ANN. Everyone of us ought to have to pass a driver-training course before we graduate from high school.

JOHN. It's the guys who drink who are causing all these accidents. After they get to be 21 and can buy liquor, they begin having accidents.

BEN. Sure, it's the adults—they cause the accidents—and then we get yelled at. The teen-agers get blamed. We're always getting blamed. (*Nods of agreement from many.*)

SUE. Ben, you have to admit that the hot-rod gang in this very school has had more than one accident this last semester—and some who aren't "hot rods"—

BEN. O.K., O.K. (*in resignation*). (*Silence.*)

TEACHER. Ann would like to pass a law—make everyone take driver training—John thinks it's autos and drinking, Ben and Ann are willing to argue about adults causing more accidents—Where shall we begin? What do you think we need more of?

CAROL. I think we need more information. Susan and Ben won't get anywhere with an argument. Let's find out.

TEACHER. You're suggesting a little background research. Who'll take a try? Where do we begin?

CAROL. There certainly should be accident information in the library.

TEACHER. There is. The National Safety Council publishes a yearbook called *Accident Facts*. Who'll locate it? It should be in our library.

MARY JEAN. I'll hunt it up. I'd like some help, though.

TEACHER. Sounds like a reasonable request. Who'll volunteer? O.K. Ben, John? Fine, and you, Sue? Good. Now for the rest of you, before tomorrow be on the lookout for articles about traffic safety, accidents—anything that has to do with the subject and bring it in.

Now, what do you recall about traffic accidents and safety regulations in our community? (*Discussion continues for remainder of period.*)

The next day, Mary Jean and her committee outline their search. The information they found in the Safety Council yearbook was presented in chart form. The students had written the essential 1956 traffic information on the chalkboard:

Age 15–24 killed in auto traffic collision—3480
Age 15–24 killed in speed-caused auto accidents—3900

JOHN. We don't like to see teen-agers included in the 15–24 age group. You know 15-year-olds can't drive.

TEACHER. How about special-permit drivers?

JOHN. I guess you're right.

SUE. I have two clippings—one about a teen-ager. (*Teacher nods, Sue reads.*)

ART. I've located one. (*Reads.*)

TEACHER. None of these people planned on cracking themselves to pieces, no one plans on having an accident.

JANE. People seem to act different when they get behind the wheel.

HUGH. They sure do. Just thinking about those new models—310 horsepower, hard-top convertibles—makes you want to push your foot to the floor and whoom—down the road you go!

JOHN. Every year they're putting more horsepower into them, too.

The discussion of new models continues. The girls are particularly impressed by the color, the chrome trim, the interior upholstery. The boys talk of hot-rod "strip-downs," piston displacement, and horsepower ratings.

The teacher leads the discussion around to:

1. The automobile as a marvel of engineering.
2. The automobile as a means of convenience and enjoyment.
3. The concept that modern inventive genius has created wonderful tools for communication and transportation, but that each new invention is accompanied by a directly related series of new responsibilities.

TEACHER. And with the modern automobile has come our present-day system of highways. All this has happened so rapidly that we have spent too much time enjoying automobiles and not nearly enough analyzing our real responsibilities if we are to use the automobile intelligently.

I've found a film which dramatizes the situation too many drivers find themselves in as soon as they slide into the driver's seat. I leave it to you to find its meaning to you personally.

(*The room is darkened, and the film* All of a Sudden *is shown.* [Sound, B&W, 12 min., Socony.] *Lights go on when the film ends.*)

SUE. That's exactly what I've been trying to say—people are different when they are driving.

HUGH. When they're sitting behind 310 horses!

BEN. I say again, it's the adults who cause all the accidents.

MARY JEAN. No, you can't, not after the figures we found on that—teen-age drivers behave the same way.

JOHN. This film is excellent—I think it's a very serious thing, this killing off thousands each year, and I'd like to know who's going to do something about it.

TEACHER. You're saying that teen-agers have a responsibility to take some action in social planning? (*John and others voice their agreement.*)

Yes, I heartily agree. If you are going to take part in community life and planning, it's time we start. (*Pause.*) But what can you do? This is a national problem. You are just one small group. (*Silence and a pause.*) Think about it—if you could do anything you wanted to as a group of young citizens in this immediate community, what would you do? We'll talk about it tomorrow.

One thing more. I've been busy collecting some data of my own. I'll show them to you tomorrow.

(*Next day.*)

TEACHER. I want to show you a group of photographs. A few weeks ago I went down to the newspaper office and to the traffic bureau of the police depart-

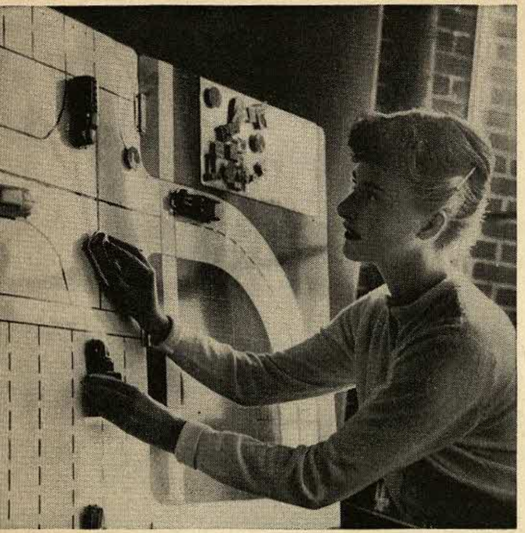

Fig. 15.4. This magnetic board permits hypothetical solutions to traffic problems. Why is this type of trial-and-error practice desirable?

ment. I asked the men at both places if they would save current traffic accident pictures for me. As you know, modern traffic control methods include making photographic records of traffic accidents. Well, I not only got many pictures from which I've selected those involving teen-agers, but Lieutenant Andrews volunteered to come out when we were ready to discuss the pictures. I now introduce the Lieutenant.

LIEUTENANT. I've been hearing about your traffic safety study, and I'm happy to be able to help you with it by bringing you some recent information about accidents here in ______. (*The lieutenant continues his report.*)

Now for the photo slides. (*Room dark, slide projector on.*)

These two cars were involved in a side head-on collision during passing. The left-hand car pulled out to pass; at the same time the approaching car did exactly the same thing. Result—collision at high speed. Six high-school students were injured; all were riding in the car on the right. It's remarkable none were killed. Two are still in the hospital in very serious condition.

Next slide. In this case the car was traveling at a high rate of speed and couldn't make a turn. It rolled over tree times; three passengers were thrown clear and badly injured. The driver, a high-school junior, was killed; he died on the way to the hospital. (*The lieutenant continues with more slides.*)

TEACHER. All these accidents took place in or near our own community.

LIEUTENANT. In a three-month period—all involved teen-agers. Two killed, fourteen injured—three very, very seriously.

JOAN. Why, it's worse than war, and— Well, why hasn't more been done?

JOHN. I guess it happens so much and so often that—well—we're just used to it.

TEACHER. We set out to find more information about traffic safety. As I listen to you, I can tell that you have been very impressed, but what do you want to do about it?

DICK. I think we ought to let the rest of the school in on it.

TEACHER. How can we do that?

JOAN. The Student Council is responsible for three auditorium programs this semester. Why not ask them to plan one of them around the problem of traffic safety?

JOHN. And use the film we saw.

Fig. 15.5. Head-on at 50 miles per hour and out of control. The local newspaper or traffic bureau takes pictures like these as part of its accident reporting. Such pictures are available to student committees or teachers in most communities. Made into 2″ x 2″ slides, they can be projected on the classroom screen as dramatic and highly visual object lessons for viewing and discussion by the entire class.

TEACHER. There are many other good films. You may want to go farther afield in your search. Maybe we can locate a better one.

SUE. That's a good idea—a program in the "aud," and by all means we should use a film.

HUGH. We can use some of the safety statistics we found, too.

BEN. There are lots of chart materials and art supplies up in the art room. Why couldn't we make a safety poster our project?

TEACHER. A good idea, and I am sure that Mr. Rankin would accept that as an art project. Hugh, will you help Ben with that? (*Hugh nods assent.*) Now, here's a list of additional films on safety: *Last Date* (Sound, B&W, 20 min., Lumbermen's Mutual Casualty Co.); *Live and Let Live* (Sound, Color, 10 min., Aetna Casualty & Surety Co.); *You Bet Your Life* (Sound, B&W, 10 min., Progressive Pictures); *Your Driving Habits* (Sound, B&W, 15 min., United World Films);

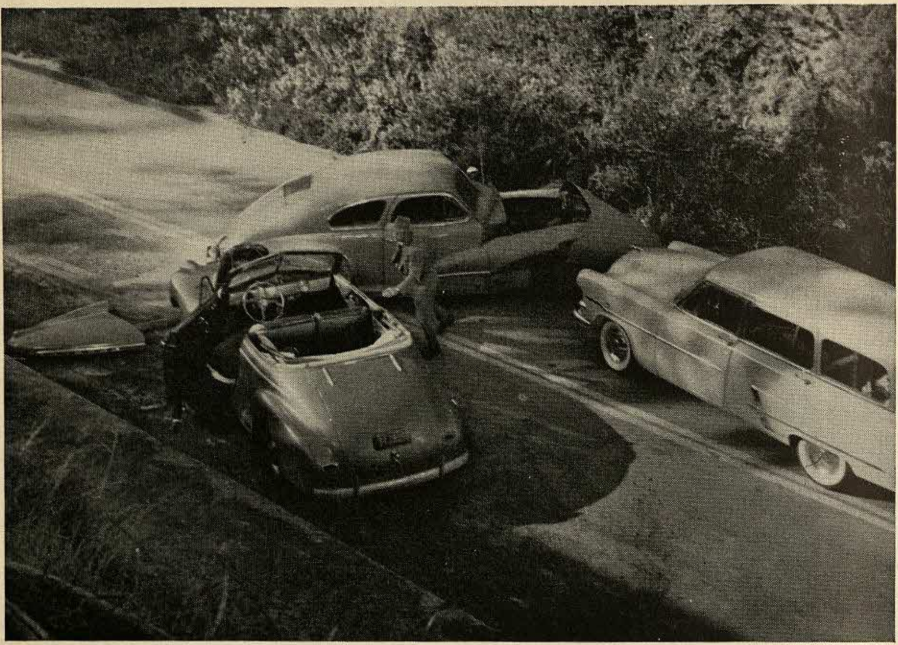

Fig. 15.6. Representative of several suitable films is this collision scene from *Chain Reaction.*

As a Matter of Fact (Sound, Color, 5 min., Farmers Mutual); *Tommy Gets the Keys* (Sound, B&W, 30 min., Farm Film Foundation); *Invisible Passenger* (Sound, Color, 22 min., Copeland Films); and *Impact* (Sound, B&W, 12 min., University of California).

Who would like to serve as a preview committee?

A preview committee is named. Two days later the committee reports their choice of *Last Date,* the story of "teenicide—the art of killing yourself before you are twenty. You use an automobile to do it." The car accident in this film was caused by the wild driving of a hot-rodder. Because it is so applicable to a typical high-school situation and so dramatically describes the effect of this one accident on these teen-agers and their families, the film is selected for the general auditorium program which will be introduced with charts and slides, and a brief panel discussion on the growing incidence of teen-age automobile accidents.

This is followed by the showing of *Last Date.* At the end of the film, a panel of students discusses its implications and suggests further activities which the entire student body can take part in—safe driving days, accident-free days, a student council safety court, a faculty-supervised hot-rod club, and an "It's Smart to Drive Safe" club, including as many of the school's "big wheels" as will volunteer for the drive toward decreasing traffic accidents.

As a parallel to student interest in a program for safe driving, the teachers, working with students and officials of the local American Automobile Association, have instituted driver education courses as a regular part of the high-school curriculum. (See Fig. 15.7.)

JOIN TEEN-AGE SAFETY COMMITTEE
PUT OVER DRIVER EDUCATION COURSE

Fig. 15.7. Enlisting teen-age interest in traffic safety and driver education courses is a key responsibility of secondary education today.

HIGH-SCHOOL MODERN LANGUAGES—ABOUT FRENCH

Foreign-language instruction is receiving greatly increased emphasis in our schools—both elementary and secondary—during the 1960's than was formerly the case. One reason is the focus on modern foreign languages (along with science and mathematics) in the National Defense Education Act of 1958. Another and more basic reason is our widespread realization of the need for foreign languages as a means of better understanding the rapidly shrinking world in which we live.

Purposes and Problems of Modern-Language Instruction. Almost universally, courses of study in modern foreign languages cite two primary objectives. The first is competence in the four language skills—aural understanding, speaking, reading, and writing. The second is a steadily increasing understanding of the foreign culture of which the language is an element. No one can quarrel with these objectives. There is little satisfaction, however, with the results of traditional language instruction, with its emphasis on grammar and reading. The attention given aural understanding and speaking skill is necessarily limited and generally ineffective.

A basic question here is whether a foreign language should be regarded as an end in itself rather than a means to an end. The people who ask it—and there are many, both in the language field and outside it—are questioning the fundamental suitability of a "grammar-translation" approach and "a decoding process in reading" for the study of a foreign language. They are also questioning whether the above two objectives are defined well enough to point the way to better instruction in terms of today's needs.

Using Audiovisual and Resource Materials. One important means devised to answer the need for more speaking-hearing opportunities in foreign-

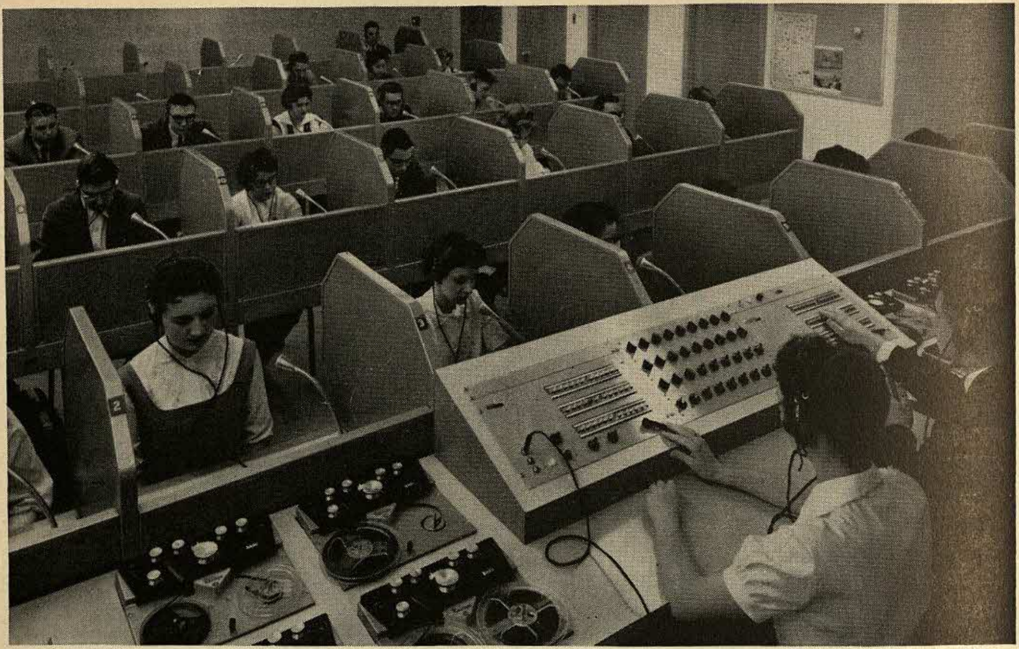

Fig. 15.8. Note the concentration of these high school students as they listen.

language instruction is the language laboratory (see Fig. 10.5) which was discussed at some length in Chapter 10. As was said there, it has many advantages. It can greatly increase both the quantity and the quality of the student's aural-oral experiences; it reduces outside distractions and hence increases concentration (Fig. 15.8); it enables him to work at his own pace both in and outside the class, the latter by means of master tapes. Furthermore, the instructor can listen in on any pupil at any time and provide assistance as necessary. Full advantage of its potential is of course lost when the language laboratory is used merely for the repetition of work done previously in class or for the practice of formal grammar exercises; in such cases it is unnecessary and its purchase is probably unjustified.

Some teachers have long used a variety of audiovisual materials—films, slides, flat pictures, maps, and globes—to make a foreign language come alive to their students. Dr. George Borglum, former head of the Department of French at Wayne State University and now director of a pilot program of audiovisual language teaching at that university, makes extensive use of specially photographed slides and films in his French classes. His coordinated approach combines the visual and audio components of language learning in a manner calculated to secure the optimum benefits of both.

> Most language laboratories make possible the repetition of audio experience but do not supply the original visual experience. At Wayne State University, the student not only can become quite glib with sentences like *"Certains touristes ont des caravanes,"* pronouncing the sentence rapidly and perfectly, but also comes to understand what *caravane* means by seeing the actual object on a screen.
>
> And this visual link is necessary because a modern French trailer no more resembles an American trailer than a Renault Dauphine resembles a Cadillac. In other words, if the purpose of teaching French is to talk about things that are French, both seeing and hearing are necessary parts of the learning process.
>
> The integration of the video and audio senses—made possible by films, colored slides, synchronized tape recordings, and the live voice of the instructor—places the learner of a new language in situations similar to those in which he learned his native language.[3]

The teacher of a high-school French class arranged to have a French chef from a local hotel visit the class one day. The chef could speak virtually no English, and the pupils were taking first-year French; consequently the teacher had to help a little. She reported the pupils' amazement and delight when they discovered that they could actually converse in French with a real live Frenchman. Such experiences can have immeasurable value in adding zest and purpose to the learning of a foreign language.

As in any other subject, interest and learning go hand in hand in a modern-language class. How do you arouse and maintain interest in language study? Perhaps we can get some useful ideas by looking in on a class whose teacher, Professor Laura Johnson of the Wisconsin High School at the University of Wisconsin, has had marked success in imbuing her pupils with genuine interest in and enthusiasm for modern-language study.

The unit on French Canada on which the class is working comes near the beginning of the second semester of high-school French. When the class begins, Miss Johnson directs the pupils' attention to a map in the front of the textbook.

"Some of you may wonder at times why we should study French. One reason is suggested on this map. What do you notice there? James?"

"There are quite a few American cities with French names like Detroit, St. Louis, Joliet and Racine."

"Fine. What else do you notice? Elaine?"

"There seem to be more French names in Wisconsin than in other states."

"Yes. As a matter of fact there are many cities and towns in Wisconsin with French names. This map shows only a few. Can you think of others? Will you write them on the board, Doris? We'll help you with the spelling."

A list of a dozen communities is written quickly on the board. As ideas

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[3] George Borglum, "AV-Active French," *NEA Journal*, November, 1958, pp. 566–568.

Fig. 15.9. Pictures provide background atmosphere and meaning to language study.

begin to dwindle, Miss Johnson asks who would like to study a map of Wisconsin and make up a more complete list. Several boys like the idea and promise to report the next day.

"Now does this raise any questions in your minds? Janet?"

"Well, I think it might be rather interesting to know how some of these places got their names—like Eau Claire and Fond du Lac for instance. You're used to hearing these names and don't really think much about them. At least I never have before."

"It makes me wonder why we have so many French names in Wisconsin," added Bob. "I know we have a lot of Germans round Milwaukee, Norwegians around Stoughton and Swiss people over around Monroe, but I've never heard of any large number of French people here in the state."

With such leads as these, the lesson on Les Français en Amérique gets under way. For several days the class reads and talks about early French explorers like Cartier and Champlain, Marquette and Joliet, and La Salle and Tonty. The textbook discussion of these explorers is in the form of interesting conversational stories which involve both geography and history and likewise provide the material for work on pronunciation, usage, and grammar. An old map of the explorers' routes, a song, and several pictures showing French influences in America are also used (Fig. 15.9).

During this phase of the work, both pupils and teacher gather illustrative material for a bulletin board display. Postcards and magazine pictures of French Canada, dolls and rugs made by peasants in the Gaspé area, and photographs taken by several pupils' families who toured the region are used. Some of this material is used as a frame of reference for vocabulary drills and oral practice.

After six chapters have been read, Miss Johnson inquires if the class would enjoy seeing a French film about the area they have been studying. "Oui, Mademoiselle," they answer.

THE LANGUAGE FILM. So that the film will have worthwhile results rather than providing merely a pleasant interlude, Miss Johnson plans several days of activities around it.[4]

On the first day she reads the film narration to the class, writing new words on the board for the pupils to copy and study before the film is shown.

On the second day a film on French Canada[5] is shown twice, with time given between showings for questions and clarification. After the second showing the class is asked to repeat phrases remembered from the film or to make descriptive comments of their own in French. The pupils themselves are surprised at the number of phrases they are able to remember or to say in their own words; there are nearly twenty such statements from the class as a whole.

Prior to a third and final showing the next day Miss Johnson repeats much of the narration, particularly the sections with which the students had difficulty the day before, and again emphasizes the new words. This time, when the film is finished, she asks the pupils to write about what they have learned about French Canada from the film. Marilyn's is as follows:

le français

Je m'appelle Marilyn
mercredi, le 21 fevrier

(une)
1. Québec est en réalité de partie de France dans le nouveau monde.
2. Les maisons sont trés vieille(s).
3. Les toits pointus et les rues étroites ont peu changé.
(la)
4. Les coutumes et les mœurs et le religion ont peu changé aussi.
5. Voici un couvent Catholique.

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[4] See Laura B. Johnson, "Mechanical Aids for Learning Languages," *French Review*, October, 1949, pp. 37–39, for discussion of a similar film lesson.

[5] *French for Beginners* (Sound, B&W, 10 min., Carl F. Mahnke Productions).

"This film presents a good picture of the life, customs, architecture, and scenery of French Canada today. The vocabulary is based on words of high frequency and well within the range of first-year students. The sound track is clear, and the rate of speed keeps the content easily comprehensible throughout. The film is highly recommended for creating an interest in our neighbors to the north, and in developing pronunciation, oral comprehension, oral facility, and vocabulary."

6. On peut voir dans le village de petites églises.
7. Les paysages sont trés pittoresque(s).
8. "Vous pouvez arrêter ici pour mange(r) fumer, et vous reposer."
9. Les femmes se servent des mêmes rouets que leur mère et leur grandmère.
10. Voici un canot de bois.
11. Québec a étè le scène d('une) bat(a)ille entre les Français et les Indiens.
12. La scène de la bat(a)ille est au'jourd'hui un parc.
13. Nous trouvons dans le parc une statue de Jeanne d'Arc.
14. Les habit(a)nts sont trés pittoresque(s).
15. Les Canadiens font cuire leur pain dans les fours.
16. Les tapis sont trés beaux.
17. Les gens sont fiers des tissages.
18. Il y a des chutes d'eau partout.
19. Le fleurie coule entre les hautes falaises.
20. Voici sa tombe.
21. Une cathédrale s'appelle Ste. Anne de Bea(u)pré.
22. On peut voir beaucoup (de) chutes d'eau.
23. Dans le canot vous pouvez pêcher.

Marilyn is one of the better students. Her list of statements, by actual count, has only fifteen minor errors, including nine in spelling or gender, three omitted accent marks, and three omitted prepositions or articles. Robert, an average student, writes fifteen statements with only minor mistakes (such as French children themselves often make) on such things as agreement of adjectives, and verb endings. The important point is that he is enjoying the satisfaction that comes from putting into French what has meaning to him.

FOLK SONGS ON RECORDS. Before beginning this unit the pupils learned "Alouette." They enjoyed hearing it in the film. On the fourth day of work on this part of the unit Miss Johnson brings in four records of French-Canadian folk songs such as "Vive la Canadienne" and "A la Claire Fontaine."[6] The words are before the pupils when they listen to the records (Fig. 15.10), and after each record they are called upon to pronounce the words as they heard them. Miss Johnson calls attention to such details as linking, elision, mute *e*'s, and pure vowel sounds.

After mastering these points, the pupils sing along with the records and become familiar with the folk songs they like best. The piano in the classroom is used to accompany them after the songs have been learned.

LANGUAGE APPLICATION. As a culminating activity a charming French-Canadian woman is invited to come to the classroom on the fifth day to talk

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[6] Victor Recordings. "A la Claire Fontaine" and "Vive la Canadienne" sung by Le Quatuor Alouette, Montreal, Nos. 56–5108 A & B; "C'est l'Aviron qui nous mène" and "Youppe, Youppe, Sur la Rivière," sung by Les Grenadiers Supérieux, Nos. B–1269 A & B.

Fig. 15.10. Foreign languages, literature, and songs can be heard in any classroom by means of foreign-language recordings. What other means of recording and playback can be used?

with the pupils and answer questions they have prepared in advance. Their great surprise and delight on discovering that they can understand and be understood by a native French woman would warm the heart of any teacher. But more than that, this experience supplies a purpose and a realism to language study which could be gained in no other way than by visiting the land where the language is spoken.

EVALUATION. What of the outcomes? Does the procedure Miss Johnson uses really lead to more effective language learning? Are the time and energy spent in the activities warranted? Let Miss Johnson herself answer:

"Although these activities occupied the major part of five class periods, I do not feel that any time was wasted, nor that any basic objectives of a language course were even temporarily neglected. On the contrary, such humdrum tasks as increasing vocabulary, improving pronunciation, developing oral facility and aural comprehension, were translated into pleasant and stimulating activities by the effective use of mechanical aids."[7]

The reader will not fail to note that the kind of outcomes just described are not achieved simply by flicking the switch on a projector or turntable. The stimulating guidance of an expert teacher who understands boys and girls and their interests is constantly evident. That such a teacher should wholeheartedly accept and use audiovisual materials in teaching modern languages is significant.

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[7] Laura B. Johnson, *op. cit.*, p. 39.

We have seen how one teacher, in teaching a unit on French Canada, used the textbook, maps, recordings, pictures, handcrafts, a motion picture, and a native French-Canadian to give vitality, interest, and effectiveness to her class work. She might also have used many other materials and techniques, such as realia, radio programs, recordings, etc.

A teacher of Spanish in a junior high school in California describes the effectiveness of a "Spanish" store much like the one in which functional English and arithmetic are practiced by elementary-school pupils. This store used cans, boxes, and bottles which had contained favorite foods, stuffed cellophane bread wrappers, wax fruit from the ten-cent store, and pictures of meat from refrigerator advertisements. Simple, indeed, but apparently effective. "After many years of teaching," says this teacher, "it still surprises me how much longer they seem to remember it [Spanish] and how much more fluent they are in its use when it is actually associated with the object, person or situation to which it refers."[8]

A college professor of German comments on the effectiveness of a series of radio programs prepared and broadcast by his class. "For the first time," he says, "at least in the case of some students, the grammar book became alive and German a living and functional thing. . . . No other class had ever developed *Sprachgefuhl* so early in the year and to a finer point than this class did."[9]

Linguaphone records have been used for many years in foreign-language instruction. These and other more recently developed courses that are on records offer such advantages as native speakers, repetition, and opportunities for guided imitation wherein students copy the speaker's intonation and pronunciation.

Publishers of elementary language textbooks are now producing records that are correlated with the textbooks. Some film producers are likewise producing records to accompany such films as *Une Famille Bretonne*[10] and *La*

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[8] Mabel Claire Keefauver, "The Use of Audio-Visual Aids in the Study of Spanish in the Junior High School," *Education*, October, 1947, p. 121.

[9] William Fraunfelder, "Radio as a Teaching Device in German," *German Quarterly*, January, 1951, p. 35.

[10] *Une Famille Bretonne* (A Lesson in French), Sound, 10 min., EBF.

This is the story of the film *French Children* told in simple French by a teacher-narrator who was born in France. In the present tense and without any subjunctives, the narration is directed at beginners and provides valuable practice in understanding spoken French. The film depicts family life on a farm in Brittany, showing the work done by each member of the family; it also includes scenes of the village school and a neighboring town. A recording of the French narration accompanies the film for practice and review.

Familia Sanchez.[11] It is to be hoped that more language recordings, correlated closely with text and film materials, will be made available.

In addition to other advantages, the use of earphones with records holds considerable promise for individual and group study in libraries and classrooms. Furthermore, teachers report that recordings seem to carry a certain authority and validity for the students which they themselves lack. This somewhat unjust comparison might be attributed in part to student familiarity with teachers and in part to the fact that there is no way of arguing with a record. Whatever the reason, the fact remains that records are a source of stimulation of which the teacher can make good use.

Whether or not the teacher has access to a language laboratory, the individual tape recorder has much to offer in the language classroom. Aside from its unique capacity of permitting the student to hear himself as others hear him, it can be used for recording group exercises, group songs, rehearsals, and interviews with native speakers, or for reviewing certain laboratory tapes which he may wish to use with the class as a whole. Furthermore, several tape recorders can be wired together rather easily to perform a number of the functions of a full-scale laboratory.

Miss Johnson's class prepared a program and recorded it on disks for the pupils of a school in Germany; final rehearsals and refinements were all worked out with a tape recorder. The resulting enthusiasm and interest in the project were reported to exceed the most optimistic expectations.

Although such a project may be a bit out of the ordinary, pupils generally derive much stimulation from any use of a tape recorder. The fascination of hearing one's own voice played back, the complete objectivity of the instrument, and the close attention typically given it by everyone present add a dramatic quality which appeals to the "ham" in all of us. Far from being undesirable, this is a characteristic which an alert teacher puts to good use.

The language teacher who conceives of French, German, Spanish, and other modern languages as a means of communicating with and understanding the world in which we live has much to gain from audiovisual materials. Probably no other subject in the curriculum can profit more from the effective use of these dynamic tools of learning. In the words of the Wisconsin Curriculum Bulletin: ". . . Through the use of this type of equipment a

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[11] *La Familia Sanchez* (A Lesson in Spanish), Sound, 10 min., EBF.

This is the story of the film *Spanish Children* told in simple and slow-paced Spanish. The vocabulary and sentence structure meet the needs of beginners. As the child watches real Spanish people going about their daily tasks, he listens to a description of what they are doing in the language they speak. The film provides a delightful visit with a rural family of southern Spain, with particular emphasis on the activities of the children. A 12-inch record, in Spanish, accompanies the film for practice and review.

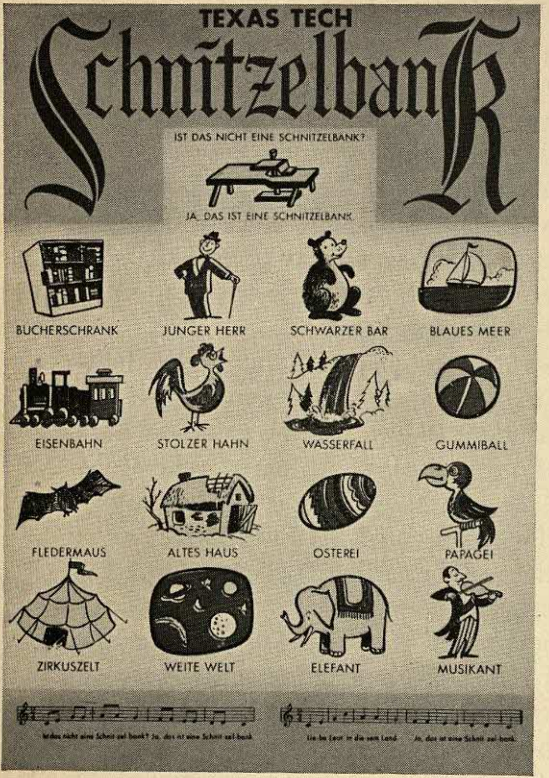
TEXAS TECH
Schnitzelbank
IST DAS NICHT EINE SCHNITZELBANK?
JA, DAS IST EINE SCHNITZELBANK
BUCHERSCHRANK
JUNGER HERR
SCHWARZER BAR
BLAUES MEER
EISENBAHN
STOLZER HAHN
WASSERFALL
GUMMIBALL
FLEDERMAUS
ALTES HAUS
OSTEREI
PAPAGEI
ZIRKUSZELT
WEITE WELT
ELEFANT
MUSIKANT
Ist das nicht eine Schnit zel bank? Ja, das ist eine Schnit zel bank
Lie be Leut in die sem Land Ja, das ist eine Schnit zel bank.

Fig. 15.11. The simple visual approach has proved effective in teaching German vocabulary.

modern language becomes a 'social study' in the broadest sense of the word and is linked to almost every subject in the curriculum and to almost any interest that the student might have. Such a program does not omit the basic grammatical aspects of the language but vitalizes them through dynamic contact with the language as it is used by a foreign people."[12]

HIGH-SCHOOL BIOLOGY—ABOUT *LUMBRICUS*

"Have you ever been curious about worms? Aside from the fact that they are good for fishing bait, earthworms are really quite fascinating. They have a rather remarkable ability, for example, to grow a new head or tail if a hungry robin happens to pull off the old one." Thus Mr. James begins his biology class one morning.

"Even though worms are not much to look at there *are* ways in which they resemble *us!* You don't believe it? Well, let's see. Some of you seem to have some ideas on that. Jerry?"

Jerry thinks that maybe worms have stomachs. Jane says that she sometimes hunted night crawlers on the lawn with her dad when she was a little girl and remembers that they pulled back into the hole in a hurry when the flashlight beam hit them, so they must have pretty good muscles.

"Yes!" agrees Bill. "And they've got nerves, too, or some kind of feeling system, else they wouldn't thrash around on a hook like they do."

Bill's remark draws suppressed squeals from several of the girls in the class, and grins from the boys.

Mr. James smiles and continues.

"Good points, all of them. Can you think of any others?" He moves to the chalkboard and writes "Digestive System," "Muscular System," and "Nervous System."

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[12] Wisconsin State Department of Public Instruction, Cooperative Educational Planning Program, *Modern Languages in a Modern Curriculum,* Curriculum Bulletin No. 23, 1950, pp. 16–17.

Further discussion suggests that worms must have some means of reproduction, so he adds "Reproductive System" under the other terms.

Judging that this line of questioning has gone far enough to establish a connection with things already known, Mr. James takes another tack.

"There are some other rather unusual things that we could learn about earthworms. For example, how they work their way through the soil, what they eat, and particularly how, aside from bait, worms are vitally important to you and me."

With this lead, the discussion proceeds for a time along lines intended to do two things: (1) to arouse further interest in the subject of earthworms and (2) to establish a purpose in studying them.

Using a Film for Introductory Purposes. Before interest begins to slacken, Mr. James brings the introductory discussion to a close and suggests that they summarize the questions that have been raised. This results in a list of specific questions, such as:

1. How do worms work their way through the soil?
2. Why are earthworms important to us?
3. What do they eat?
4. How do they reproduce? Do they lay eggs?
5. What happens to earthworms in the wintertime?

With the period now about half over, Mr. James says, "Thinking that you might be interested in the subject of earthworms, I arranged for a film that may help us answer some of these questions. It's a good film and I think you will enjoy it. Keep in mind the questions we have here and see if you can find some of the answers."

The projector has been set up and threaded ahead of time by one of the several operators in the class, for the showing of this film has been scheduled previously. The dark shades are pulled quickly and the film, *Earthworm,*[13] is shown.

After the film ends, Mr. James asks how many have found answers to their questions. About half the pupils raise their hands.

"What was the difficulty for the rest of you? Jean?"

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[13] *Earthworm,* Sound, BW, 20 min., British Information Services.
It describes the internal structure by means of dissected studies and illustrations. Digestive, circulatory, excretory, and reproductive systems are stressed. Animated diagrams of the processes of coition, egg laying, and cocoon formation are presented; the film ends with the birth of new individuals.

"Well, I found some of the answers all right, but there was so much there that we hadn't talked about that I got mixed up, I guess."

"Ralph?"

"I didn't see anything about what worms do in the wintertime."

"Tony?"

"There were quite a few names that were new to me. Maybe that made it hard to follow—I don't know."

"How many of you found it interesting even though you couldn't follow everything in the film?" This time there is general assent.

"That's fine. We'll discuss those questions tomorrow. Meantime it would be a good idea to find what your text has to say about the questions. The reference is on the board. There is also a list of interesting articles posted in the library; you may want to read them while we are studying earthworms."

Use of Model and Chart. The next day when the class comes into the room, a large-scale model of an earthworm is on display and on the front wall is a good-sized wall chart. Mr. James has also put several colorful pictures on the bulletin board under the heading, "How Does the Earthworm Live?" The display is only partially completed, but several pupils stop to look at it.

Discussion gets under way promptly on the questions raised the day before.

"Who can explain how the worm moves about? Victor?"

"They crawl along on some kind of feet—I think the book called them 'bristles.' They act something like hooks. The worm hooks onto the ground with his back bristles and pushes forward with his head and stretches out. Then he hooks onto the ground with his front bristles and pulls his back part up to the rest of him."

"That's very good, Victor. Who can show us these bristles on the chart?"

Jane points them out on the wall chart, which is large enough to show such details quite clearly.

Someone asks how the bristles are controlled. This, in turn, leads to a consideration of muscles and nerves and whether or not the earthworm has a brain. The model (Fig. 15.12) is helpful in identifying muscular, nervous, and circulatory systems, because it shows the interior structure of the worm in three dimensions. Mr. James refers from wall chart to model and back again repeatedly during the discussion.

Pupil Participation. Several of the boys volunteer to bring in some worms for closer examination. Study of these worms results in a variety of interesting observations as to how they crawl, the lubricating liquid on their body surface, and the girdle.

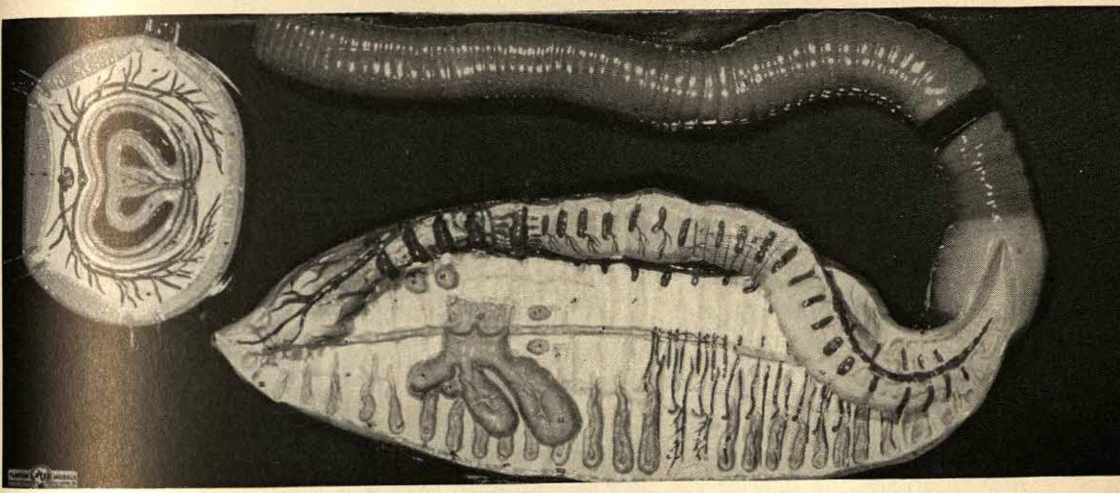


Fig. 15.12. How can a model be of particular help in showing the relationship of organs, muscles, nerves, and blood vessels?

A few worms are placed in a battery jar full of damp earth and left for several days. Occasionally a worm is seen burrowing its way through the soil next to the glass. Carefully removing a section of the soil after it has dried out somewhat makes visible a network of little tunnels. Several boys check the entomology journals to discover the importance of earthworms in ventilating and constantly mixing the soil.

Laboratory Possibilities. By this time Mr. James feels that there is sufficient interest and information to warrant dissecting a number of worms. When he suggests this, he gets a good response from about a dozen pupils. He does not urge the more reluctant students to do the dissections themselves; instead, he suggests that the class work in pairs so that those who do not participate directly can observe.

If the experience is to have value, Mr. James knows that a few guideposts must be set up. Otherwise, cutting up a worm may prove to be an end in itself rather than a means to a better understanding of earthworms.

"Before we start dissection, does anyone have a question? Ralph?"

"I'm not sure I know how to go about it—just how to start, I mean."

"That's a good point, Ralph. We need to know that, of course. Any other questions? Judy?"

"Well, I think we need to know what to look for, too—more than just in general, that is. Otherwise we might miss something or cut through it without seeing it."

"Very good, Judy. How many agree with Judy? Quite a few do."

Jean somewhat reluctantly raises her hand.

"Mr. James, I know this is silly, but won't this be terribly painful for the worms? I mean that—well, it seems rather inhuman to just cut up live worms to see what's inside."

"I'm very glad you asked that, Jean, because it hadn't occurred to me and doubtless others feel the same way. Actually these worms we will dissect are specimens which have been chloroformed and preserved in alcohol for just this sort of work. We could use live worms but we would chloroform them first. That is a painless way of killing them.

"Now Ralph thinks we need to know more about how to dissect a worm and Judy says that we need to know what to look for when we do this. Can anyone think of a good way to answer these questions?"

Using the Film for a Second Purpose. Someone quickly suggests that they again see the part of the film in which an expert is dissecting a worm. Mr. James agrees but takes the opportunity to say that a number of technical terms are involved. These terms—"cuticle," "epidermis," "esophagus," "larynx," "crop," "alimentary canal"—must be understood if the dissection is to be followed. They are thereupon discussed briefly and the pertinent section of the film is shown.

After this, the dissection process is discussed and the students are ready to go to work in the laboratory. Their work on dissection answers many questions but raises others which may become the basis for further activity: "How long does a worm live?" "What other kinds of worms live in the soil?" "Does the earthworm do any harm to crops?" "Can you get too many worms in a given piece of ground?" "What keeps worms from drowning when it rains?" "How do they breathe?" and so on.

Each question may be investigated by an individual or a group. Some leads will prove more useful than others for Mr. James' objectives in this study of earthworms, but he encourages the pupils to track down the answers so that their curiosity will be satisfied. At appropriate points he provides for summaries, for integrating what has been learned into clear concepts. These, in turn, are applied to generalizations such as adaptation to environment, food-getting processes, locomotion, reproduction, and defenses against natural enemies. Mr. James also plans for tests of one kind or another to measure progress and the effectiveness of the methods he is using.

Initial Planning—How This Lesson Came About. It will be interesting to turn back the calendar a few days to see how this lesson came to be.

Mr. James, like all teachers who are approaching a new unit of science work, had to find practical answers to the questions: (1) What learning difficulties are involved in this study of earthworms? and (2) How can these difficulties best be met?

Looking at it from the pupil's viewpoint, as every good teacher does, he lists the following practical difficulties:

1. Although somewhat familiar to most pupils, earthworms are naturally neither attractive nor interesting to the average youngster.
2. Most of the earthworm's life is spent underground, out of sight and out of mind. Probably most of my pupils have never considered the earthworm as in any sense valuable to man or as typical of a class of animals. How can these phenomena be shown effectively?
3. One can best understand the structure of the earthworm by dissecting it. This will attract some students but repel others. How can I change the later attitude? Also how can sufficient skill in dissection be developed without spending too much time on it?

As solutions to the above, Mr. James draws up the following plan of attack:

1. Start with what the pupils know about worms and appeal to the children's curiosity about themselves and the world around them. Motivate them with one or two striking and unusual facts about worms and base the discussion on known similarities to other animals.
2. Since we do not see earthworms close up very often, I'll ask some pupils to bring some to class and put them in a battery jar that contains some earth. Then we'll see what they do to the soil. Use a wall chart for general structure, and a model for structural relationships. Use the *Earthworm* film for introductory overview; show it again later for detail. Arouse curiosity questions prior to showing the film; follow the film with a discussion of these, and plan for further activities.
3. These "further activities" should lead to a consideration of dissection. By now, if earlier steps have been well handled, some will go along with the idea. Don't force it; let the other pupils observe. Show part of the film to demonstrate dissection processes. Discuss vocabulary before seeing the film. Suggest that dissection be followed up by notebook drawings.

This, in part, is the way one teacher went about the learning problem in his biology class. Various other ways might work equally well, for teaching is an art, and as an art it has no rigid rules of procedure. Good teaching does have sound fixed principles, however, which are based on the nature of the child and on how he learns. Two of these principles are: Think always in terms of the pupil and his needs, and make the learning experience realistic and vivid to him by every possible means.

Prominent among these means are the audiovisual materials used by Mr. James and his class. Note that he introduced them naturally where they would do the most good. In no way did he minimize text and reference materials, but he recognized that the study of earthworms also requires appropriate audiovisual materials including the worms themselves.

Note also that neither by word, thought, nor action did Mr. James suggest, as sometimes happens, "Now that we've seen the film, let's get back to the lesson." The film *is* the lesson; the text assignment *is* the lesson; the chart, the chalkboard, the model, the worms and the other materials that have been or will be used—all are integral parts of the lesson and were so regarded by both him and the pupils.

By being thus used, the materials of instruction can reach a new "high" in effectiveness. Audiovisual materials, like the reading materials which are carefully chosen and used well in terms of the student's needs, will thus come of age. When they function at full capacity, they become more than simply aids or crutches for either pupil or instructor. They become true media of communication for both learning and teaching.

SUMMARY

The most effective use of audiovisual materials of instruction is attained when they are selected and used in terms of their known value in creating or re-creating realistic and interesting learning experiences.

The teacher assumes several key responsibilities when selecting and using audiovisual materials in the classroom. Among them are (1) definition of learning goals, (2) selection of learning experiences, (3) correlation of appropriate learning experiences, and (4) guidance of the class in using these materials in accordance with the best research and utilization principles.

Audiovisual materials are means of enriching learning opportunities. It is the teacher, however, who supplies the skill, imagination, and guidance which mean the difference between successful and mediocre use of audiovisual materials.

Suggested Activities

1. Visit classrooms to observe how audiovisual materials and techniques are being used. Select classrooms which are close to or identical with your professional training or teaching interests.
2. Use audiovisual materials or techniques in your own day-to-day teaching or practice teaching.
   a. Set up objectives or goals.

b. Preview and select instructional materials.
c. Plan introductory interest-inciting activities.
d. Provide for the planning of purposes by the pupils.
e. Secure selected audiovisual instructional materials and arrange for their actual use.
f. Tentatively plan follow-up activities.
g. Objectively evaluate outcomes in terms of pupil interest, understanding of new information, pupil initiative in pursuing self-inspired activities, etc.

This last may be an objective measure of your grasp of the significance of the role of audiovisual materials and techniques in implementing the curriculum and improving instruction.

Bibliography

Alden, Douglas W. (ed.), *Materials List for Use by Teachers of Modern Foreign Languages,* Modern Language Association Foreign Language Research Center, 1959.

Alexander, Theodor W., "Practical Scientific German with Color Slides," *Modern Language Journal,* January, 1954, pp. 12–14.

Alexander, Theodor W., "Functional German at Texas Technological College: Audio-Visual Approach," *German Quarterly,* May, 1955, pp. 175–179.

Brooks, Nelson, *Language and Language Learning, Theory and Practice,* Harcourt, Brace, 1960.

Cornfield, Ruth R., "Not by Sound Alone," *Audiovisual Instruction,* December, 1960, pp. 338–339.

Council of Chief State School Officers, *Purchase Guide for Programs in Science, Mathematics, and Modern Foreign Language,* Ginn, 1959.

Dale, Edgar, *Audio-Visual Methods in Teaching,* Dryden, rev. ed., 1954.

Fraunfelder, William, "Radio as a Teaching Device in German," *German Quarterly,* January, 1951.

Johnson, Laura B., "Use of Audio-Visual Aids in Foreign Language Teaching," *Modern Language Journal,* November, 1946.

Johnson, Laura B., "Mechanical Aids for Learning Languages," *French Review,* October, 1949, pp. 37–39.

Johnson, Laura B., "Films in Foreign Language Teaching," *French Review,* April, 1956, pp. 414–417.

Kale, S. V., and Grosslight, J. H., *Exploration Studies in the Use of Pictures and Sound for Teaching Foreign Language Vocabulary,* Technical Report SDC 269–7–53, Instructional Film Research Program, Pennsylvania State University, August, 1955.

Keefauver, Mabel Claire, "The Use of Audio-Visual Aids in the Study of Spanish in the Junior High School," *Education,* October, 1947.

Kone, Elliott (ed.), *Language Laboratories—Modern Techniques in Teaching Foreign Languages,* Bulletin 19, Connecticut Audio-Visual Association, 1960.

Kovach, E. M. A., "Audio-Visual Materials Available for Teachers of High School Latin," *Classical Journal,* January, 1956, p. 145.

Lado, Robert, *Linguistics Across Cultures: Applied Linguistics for Language Teachers,* Univ. of Michigan Press, 1957.

Mueller, T., "Audio-Visual Approach to Modern Language Teaching," *Modern Language Journal,* May, 1955, pp. 237–239.

O'Connor, Patricia, *Modern Foreign Languages in High School, Prereading Instruction,* U.S. Office of Education Bulletin 1960, No. 9.

Parker, Edna, "Materials Make a Difference," *Audiovisual Instruction,* January, 1960, pp. 6–7.

Pei, Mario A., "Our Job as Language Teachers," *School and Society,* November 9, 1946.

Roberts, W., "Use of 2 x 2 Slides in Advanced Undergraduate French Classes," *Modern Language Journal,* October, 1954, pp. 295–298.

White, Frederick A., *A Survey of the Content of Basic Audio-Visual Courses Through the Opinions of Selected Teachers,* unpublished seminar report, Univ. of Wisconsin, 1951.

Winsor, George B., *The Status of Audio-Visual Instruction in Selected Teacher-Training Schools,* unpublished seminar report, Univ. of Wisconsin, 1951.

Wittich, Walter Arno, and Fowlkes, John Guy, *Audio-Visual Paths to Learning,* Harper, 1946, pp. 29–75.

Witty, Paul, *Gray Squirrel* (It's Fun to Find Out Series), Heath, 1950.

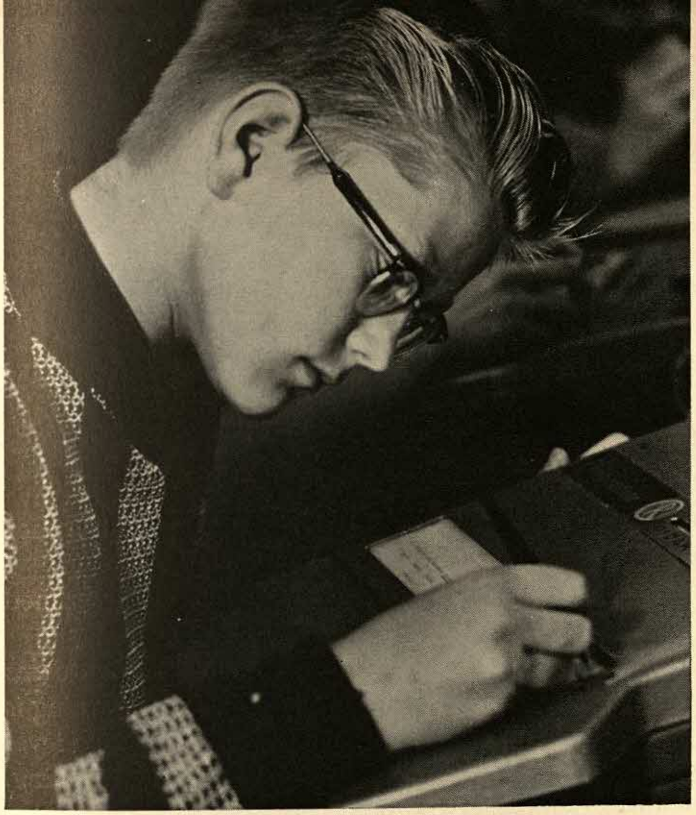
Films

French for Beginners, Sound, B&W, 10 min., Carl F. Mahnke Productions.

German Language Film Nos. 1, 2, 3, 4; Sound, B&W, 20 min. each, University of Wisconsin, Bureau of Audio-Visual Instruction.

Hawaii, an Island State, Sound, Color, 18 min., United World Films.

Henry Wadsworth Longfellow, Sound, B&W, 16 min., Encyclopædia Britannica Films.

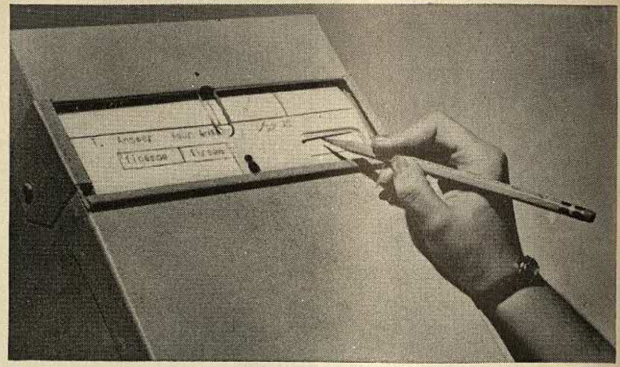


CHAPTER 16

TEACHING MACHINE PROGRAMED LEARNING

THE "TEACHER" STOOD immediately beside the student, both of them completely absorbed in the subject being learned. Each time the pupil made a judgment and wrote an answer, the "teacher" commented on its correctness. If the answer was correct, the student proceeded immediately to the next task. The "teacher" geared this assistance to the student's pace, moving ahead rapidly when the student was able to, and taking more time when he paused to think before making decisions about more difficult tasks. When the student experienced difficulties, the "teacher" offered an appropriate bit of review or suggested neces-

Fig. 16.1. These three teaching machines illustrate the range of those currently available. In the simplest models, verbal learning materials only are presented on sheets of paper as reading materials. In the most complex, learning materials are presented by means of the printed page, slides, filmstrips, motion-picture film, or tape recordings.



sary intermediate information which helped him. Always, however, the pace at which the pupil moved was left to his discretion.

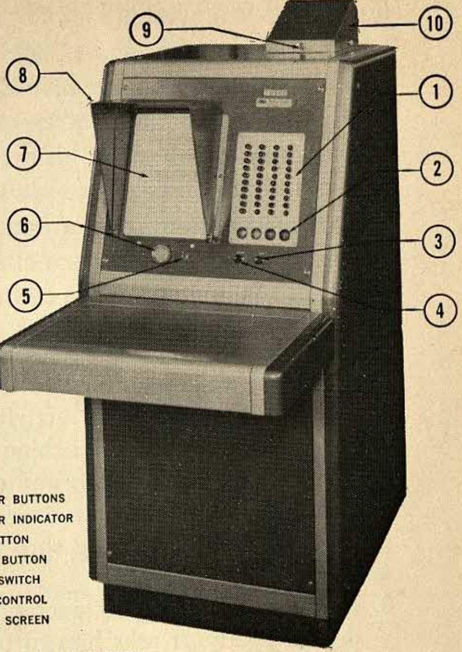
This "teacher" is a teaching machine and its accompanying programed learning materials.

This description is not fanciful. It is a reality today in countless classrooms across the country in which a newly created means of automated learning is being subjected to tryout and experimentation at almost every grade level and in most subject areas. This chapter describes the development, meaning, and use of teaching-learning machinery, programed materials, and techniques.

CHARACTERISTICS OF TEACHING MACHINE PROGRAMS

A teaching machine is a mechanical device which can be operated easily by a student as he makes his own way through learning materials. Teaching machines and their accompanying programs vary in complexity and cost from the simple and inexpensive to the complex and costly (Fig. 16.1). Almost all of them have such characteristics in common as the following:

1. Study materials are arranged in step-by-step sequences of exact questions to which the learner responds overtly, usually by selecting, manipulating, or writing in answers.
2. The learner is given immediate knowledge about the correctness of his responses.
3. He proceeds at his own pace and thus is free of the restrictions on individual progress commonly associated with classroom group instruction.
4. Information is presented in such a way that it leads him forward logically and with comprehension from one step to the next and requires his sustained participation.



1. SELECTOR BUTTONS
2. SELECTOR INDICATOR
3. VIEW BUTTON
4. MOTION BUTTON
5. ON-OFF SWITCH
6. FOCUS CONTROL
7. VIEWING SCREEN
8. HOOD
9. RECORDER TAPE VIEW WINDOW
10. RECORDER TAPE AND TAKE-UP MECHANISM

These qualities call for analysis of the subject content and the application of a precise psychology of learning.

DEVELOPMENT OF THE TEACHING MACHINE PROGRAMED LEARNING IDEA

The very essence of the teaching machine program as a means of automated learning depends on the fact that a large area of the subject information it deals with is constant in nature. This is usually true of spelling, arithmetic operations, many rules of grammar, certain scientific phenomena, geographical information, dates and places of historical events, etc.

Automated learning was being investigated as early as the 1920's, when Dr. Sidney Pressey designed one of the first teaching machines. These devices provided the student with questions and multiple-choice answers. After selecting his answer, the student recorded it by pressing a numbered button which corresponded to the number of the answer. The machine immediately indicated the correctness of the response, if it was correct. Thus learning took place, evaluation was immediate, and progress was encouraged.

This early research work has been repeated and improvements made by many investigators, of whom the best known is B. F. Skinner.[1] The machine programs he devised incorporated improvements which not only measured information but provided the learner with a developmental sequence of judgments arranged in logical order. The material to be learned is presented to the student, one "frame" at a time, in a small window on the face of the machine. The student writes his response on a section of paper in a slot near this window. He then moves a lever, thus exposing the correct response, and compares this with his written response. If his answer is correct, he brings the next frame into view and repeats the process. If the response is incorrect, the question is automatically "marked"; it reappears later to give the learner a chance to correct and learn. Skinner describes the characteristic of his machine program as follows:

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[1] B. F. Skinner, "Teaching Machines," *Science,* October 24, 1958.

> 1. There is a constant interchange between the programmed materials and the student. Unlike lectures, textbooks and the usual audio-visual aids, the machine induces sustained activity. The student is always alert and busy.
> 2. Like a good tutor, the machine insists that a given point be thoroughly understood, either frame by frame or step by step, before the student moves on. Lectures, textbooks and their mechanized equivalents, on the other hand, proceed without making sure that the student understands and easily leave him behind.
> 3. Like a good tutor, the machine presents just that material for which the student is ready. It asks him to take only that step which he is at the moment best equipped and most likely to take.
> 4. Like a skillful tutor, the machine helps the student to come up with the right answer. It does this in part through the orderly construction of the programmed information and in part with technics of hinting, prompting, suggesting and so on, derived from an analysis of verbal behavior.
> 5. The machine, like a private tutor, reinforces the student for every correct response, using this immediate feedback not only to shape his behavior most efficiently but to maintain it in strength in a manner which the layman would describe as "holding the student's interest."[2]

In spelling, for example, the material Skinner uses to teach the spelling of the word "manufacture" is based on the difficulties involved in mastering this word. It is not enough to memorize; the pupil is expected to understand and grasp its meaning from analyzing the root of the word, the choice of letters, the repetitious use of letters, and so forth. The technique is shown in Table 16.1.

The pupil's first task is to copy the word. He must next identify the root "fact," and then the root "manu." In the fourth and fifth frames he is asked to insert letters. Finally, he is tested on his ability to grasp the entire word.

Arithmetic is another illustration. Too often arithmetic is a matter of drilling for memorization. However, it can be made an experience in understanding number relationships logically. In the multiplication table for 9, for example, the machine cards present not only the table for 9, but some of the basic principles involved in understanding the behavior of this number. For example, 9 times a number is the same as 10 times that number minus the number; i.e., 9 times 3 is 27; 10 times 3 is 30, and 30 minus 3 is 27.

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[2] *Ibid.*

So also, the digits in a multiple of 9 add up to 9; thus 18 is 1 plus 8; 36 is 3 plus 6; 81 is 8 plus 1. The cards also point out that, in composing successive multiples of nine, one counts backward: *nine*, *eight*een, twenty-*seven*, thirty-*six*, forty-*five*, fifty-*four*, sixty-*three*, and so forth. Thus, as the subject card outlines these relationships and calls upon the student to fill in the blanks correctly, his ability to understand the logic of a multiplication sequence and to multiply accurately are tested simultaneously.

Table 16.1. Spelling Display; a Set of Frames Used in a Teaching Machine

1. MANUFACTURE means to make or build. *Chair factories manufacture* chairs. Copy the word here.

   ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

2. Part of the word is like part of the word *factory*. Both parts come from an old word meaning *make* or *build*.

   MANU ___ ___ ___ ___ URE

3. Part of the word is like part of the word *manual*. Both parts come from an old word meaning *hand*. Many things used to be made by hand.

   ___ ___ ___ ___ FACTURE

4. The same letter goes in both spaces.

   M ___ NUF ___ CTURE

5. The same letter goes in both spaces.

   MAN ___ FACT ___ RE

6. Chair factories ______________________ chairs.

In the usual classroom situation much of the recitation time is taken up by one pupil as he recites to the teacher. The teacher cannot be sure that the other pupils are following the recitation, nor can he supervise the thinking that is actually being done by every pupil during the period, particularly by those who are not actively participating.

But when a student is using an auto-instructional device, all interaction takes place between him and the subject content. In other words, there is intense individual application over a short period of time rather than sporadic group activity over a longer period. It is entirely feasible for a classroom to have four or five teaching machines which make appropriate programed learning information, in sequence, available to individual learners. By staggering the students' work, for example on arithmetic and on spelling, and vice versa, the machines could be kept in constant use.

ARRANGING OR PROGRAMING TEACHING MACHINE MATERIALS

The real art in using a teaching machine lies in the "content" or "lesson sequences" or "programs" created for the machine, the material to be reacted to and learned by the pupil.

The teaching machine's potential for instructing is as wide as the imagination of the teacher and the psychologist, and their ability to develop the sequential information that is fed into the machine itself, but the participation of both is needed if good teaching machine materials are to be created. As the teachers of subject content work with psychologists in the field of learning, they gain skill in arranging dependable and worthwhile materials. Sequences are currently being prepared in such areas as spelling, science, algebra, and arithmetic. (See Source Lists, page 477.)

USING A TEACHING MACHINE PROGRAM

How does a teacher actually use a teaching machine? The best way to answer this, of course, is for him to examine a simple model and familiarize himself with it. The following description is taken from a college course in measurement and statistics prepared by a subject expert who spent several weeks isolating the specific items of information to be learned during a one-semester course. Then, with the assistance of a psychologist in the field of learning, he arranged the items in ladderlike order from simple to complex, each item leading logically to the next.

The first 29 concepts to be learned are on a disk which the student inserts in the machine, in this case a simple "mechanized" folder (Fig. 16.2*a*). The folder is closed and the student writes his name on the answer sheet (*b*). The student fixes his attention on Problem 1 and reads it (*c*); he records his answer and notes this first step (*d*). He then moves a lever to bring the correct response into view (*e*). Thus he immediately evaluates his response to Problem 1. If it is incorrect he realizes this at once and learns the correct one from the answer revealed by the machine. Either way, he is entitled to proceed to Problem 2 (*f*). Again he reads, makes a response, evaluates, scores, and proceeds. He continues this process of self-learning and evaluation as long as his energies, interest, and enthusiasm persist (*g*, *h*, *i*, *j*).

Because of their interest, ability, and willingness to accept responsibility for the tasks involved in self-learning with a learning machine, such as has just been described, some students have been able to learn factual information at a rate far beyond that normally expected in the traditional classroom.

Thus, a teaching machine experiment at Roanoke, Virginia, has shown that eighth-grade pupils accomplished a full year's course in algebra in one semester—half the time required by their ninth-grade friends who took the traditional course.[3] Forty-five percent of the eighth-grade group attained the level of performance attained by 50 percent of the ninth-grade group. Other research studies indicate almost identical advantages as far as speed and accomplishment are concerned.

The use of teaching machines is not restricted to upper-level subjects and pupils. Recent experimentation with nonverbal materials has demonstrated the effective use of automated materials at kindergarten and primary grade levels (Fig. 16.3). This experimental use of teaching machines by very young pupils has strengthened the belief that there are identifiable areas of the curriculum which can be efficiently taught by means of carefully programed lesson sequences.

Other research on the use of teaching machines indicates that substantial areas of subject content can be learned with increased efficiency through their use. These researchers also believe that:

1. Gifted children who have self-motivating qualities can progress at a pace limited only by their interest.
2. The use of teaching machines and materials will free teachers to give additional time to counseling, individualized instruction, and the discussion of difficult areas of subject content not readily adaptable to teaching machine presentation.
3. The use of teaching machines will increase the speed of accomplishment because pupils who can and will use these new materials can move ahead at an accelerated pace.
4. Teaching machines will be developed which incorporate audio and visual experiences, thus invading subject content areas more complicated than those which rely on the written word alone. (See Fig. 16.1, extreme right.)
5. The teaching machine's ability to correct or evaluate the work of the pupil immediately permits him to move rapidly from step to step in learning a sequence of facts or operations. This is an obvious advantage over the use of workbooks in the primary grades, where hours or a day may elapse before a child knows whether his work is correct. So also, in high school, papers are graded while pupils are working on their next assignment, although the students should know the results of their previous efforts before going on to a more advanced task.

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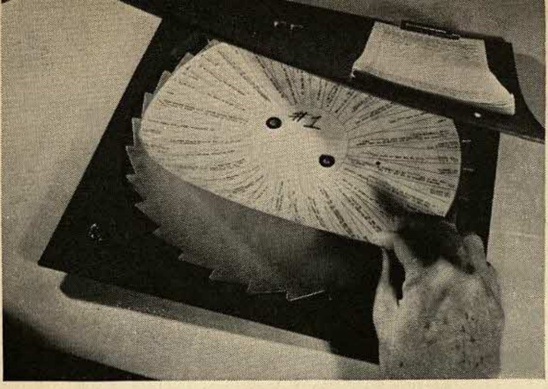
[3] E. W. Rushton, "Teaching Machines, a Research Report," *Nation's Schools*, February, 1961.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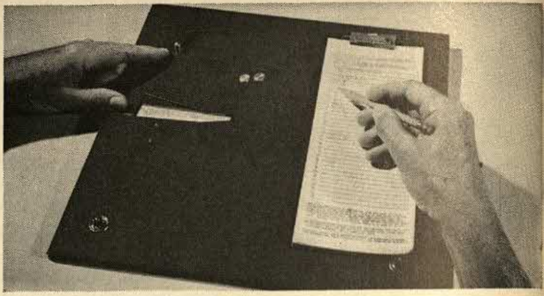
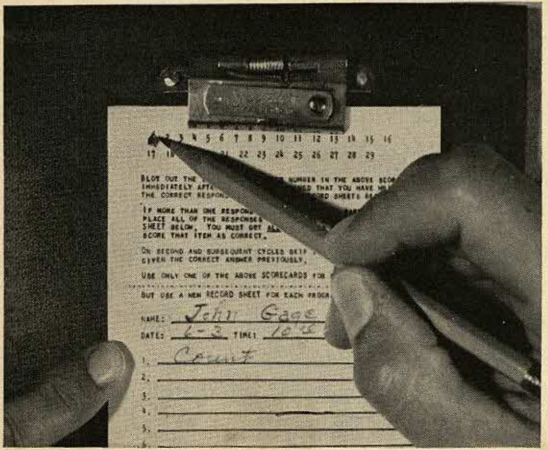
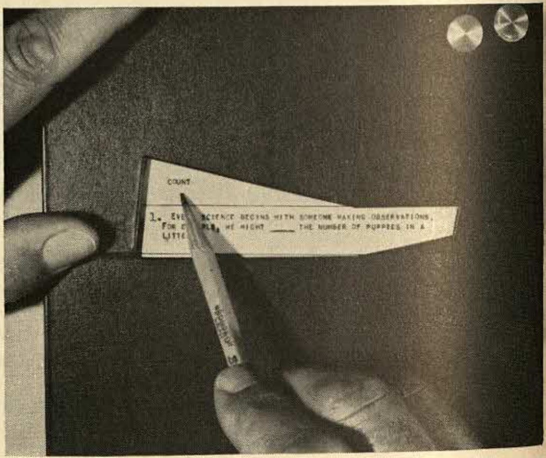
(a)



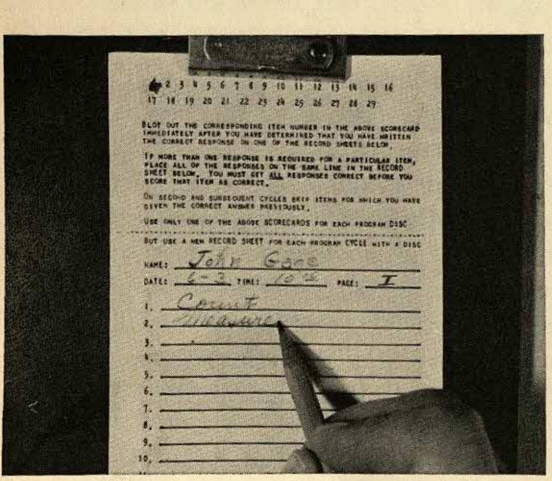
(b)


John Gage
6-3
10
Count

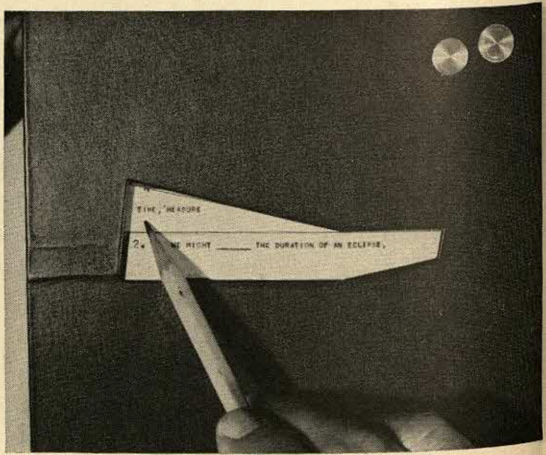
(d)


COUNT
1. EVE SCIENCE BEGINS WITH SOMEONE MAKING OBSERVATIONS.
FOR E PLE, HE MIGHT ____ THE NUMBER OF PUPPIES IN A
LITTE

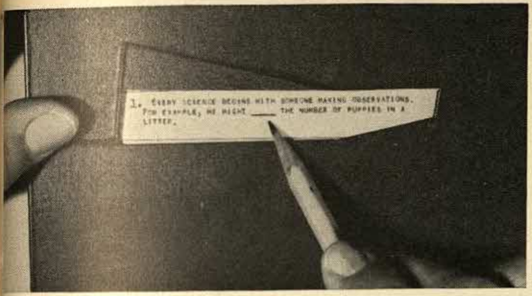
(e)


2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29
BLOT OUT THE CORRESPONDING ITEM NUMBER IN THE ABOVE SCORECARD IMMEDIATELY AFTER YOU HAVE DETERMINED THAT YOU HAVE WRITTEN THE CORRECT RESPONSE ON ONE OF THE RECORD SHEETS BELOW.
IF MORE THAN ONE RESPONSE IS REQUIRED FOR A PARTICULAR ITEM, PLACE ALL OF THE RESPONSES ON THE SAME LINE IN THE RECORD SHEET BELOW. YOU MUST GET ALL RESPONSES CORRECT BEFORE YOU SCORE THAT ITEM AS CORRECT.
ON SECOND AND SUBSEQUENT CYCLES SKIP ITEMS FOR WHICH YOU HAVE GIVEN THE CORRECT ANSWER PREVIOUSLY.
USE ONLY ONE OF THE ABOVE SCORECARDS FOR EACH PROGRAM DISC
BUT USE A NEW RECORD SHEET FOR EACH PROGRAM CYCLE WITH A DISC
NAME: John Gage
DATE: 6-3 TIME: 10 PAGE: I
1. Count
2. Measure
3.
4.
5.
6.
7.
8.
9.
10.

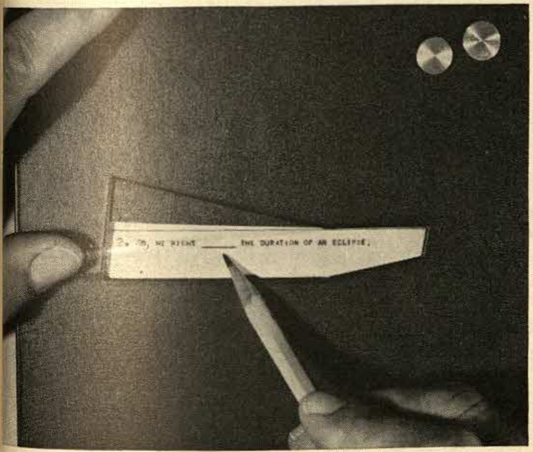
(g)


TIME, MEASURE
2. E MIGHT ____ THE DURATION OF AN ECLIPSE.

(h)


1. EVERY SCIENCE BEGINS WITH SOMEONE MAKING OBSERVATIONS. FOR EXAMPLE, WE MIGHT ____ THE NUMBER OF PUPPIES IN A LITTER.

(c)


2. SO, WE MIGHT ____ THE DURATION OF AN ECLIPSE.

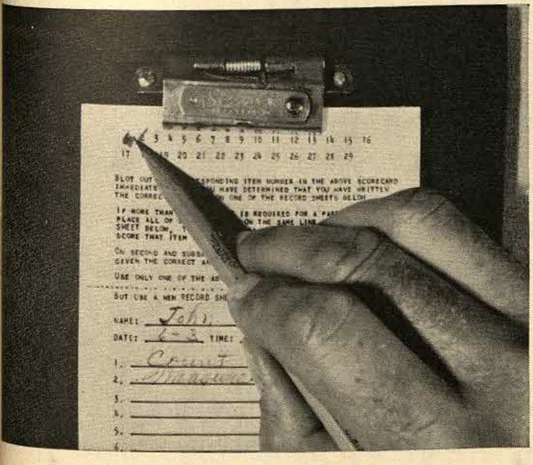
(f)

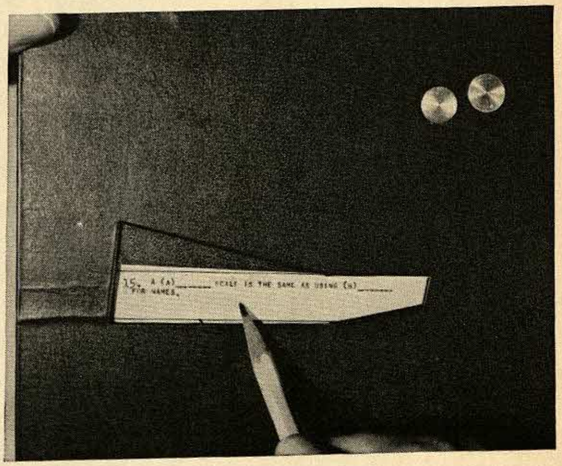
Fig. 16.2.

6. Evaluation of work is accurate because mistakes are not likely to occur in carefully programed teaching machine materials.

ROLE OF THE PUPIL

Pupils have become accustomed to working in a situation in which each pupil is one of as many as thirty or more students in the classroom. The pace at which they learn is geared to the usual recitation in which, if the teacher is continuously active, most of the pupils participate in questions and answers once or twice in the class period. As was said earlier, even at best a pupil may be directly involved for only the few minutes he is responding directly to the teacher's questions or suggestions. During the major portion of the time, most of the pupils have no active role.


(i)


15. A (A)____ SCALE IS THE SAME AS USING (N)____ FOR NAMES.

(j)

In contrast, when a learner is using a teaching machine, he is directly and continuously involved for the entire period. There is no delay. He moves from step to step just as rapidly as he can, just as if there were only one learner and one teacher.

This kind of learning is likely to be much more demanding and more strenuous than traditional classroom instruction. For this reason, the pupil may experience fatigue more quickly. There is much to be learned about the relation between teaching machine procedures and pupil interest and attention span. Evidence already available indicates that whereas working with a teaching machine is highly motivating to some learners, it is less so to others; a few learners can work intensively for long periods, but others fatigue or lose interest after only a short period of intensive attention.

ROLE OF THE TEACHER

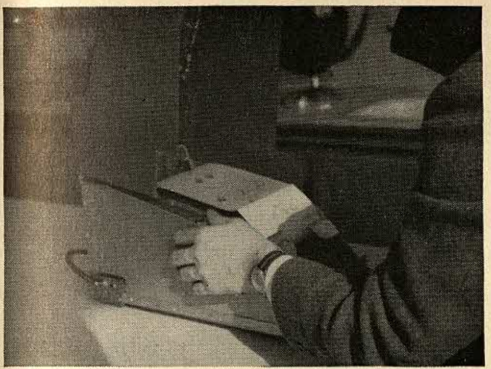
Preparing carefully programed teaching machine materials is not to be compared with quickly composing a twenty- or thirty-minute objective test of a unit of work. On the contrary, the preparation, experimental trial, and reworking of a teaching machine "course" may take the time of two or more professional educators and psychologists over a period of months or years. Hence the teacher's task is to select such materials rather than create them. But just as several teachers sometimes participate in writing a textbook, so many will participate in creating teaching machine programs.

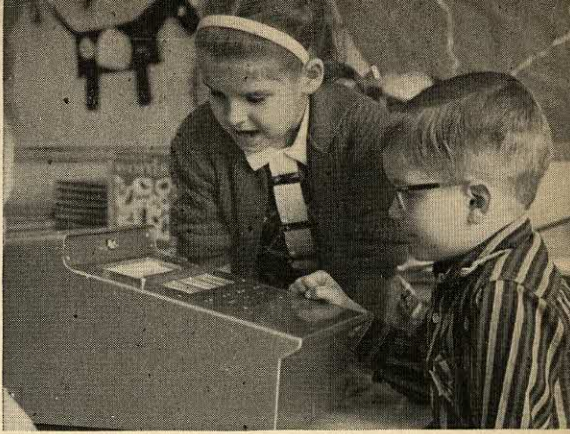
The teacher has several types of program from which to choose, including step-by-step, branching, and cross-media programs.

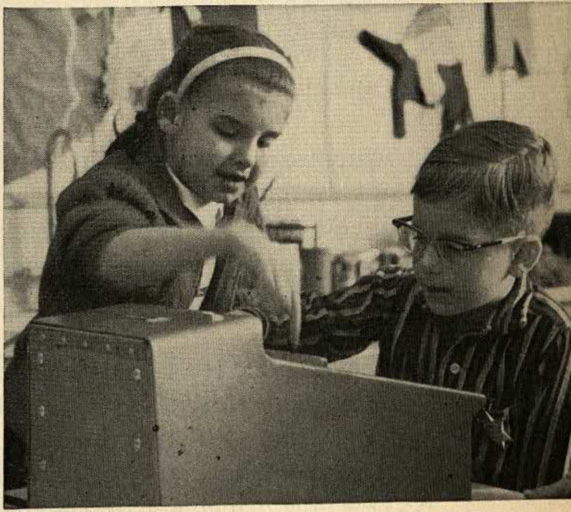
In the step-by-step programs the subject content is usually broken down into the most logical sequence of developmental steps. The pupils in an entire class might take turns using the three to six machines in the room, pacing themselves as their abilities and interest warrant. This learning process may be compared to climbing a long stairway on a series of uniformly spaced steps; some will climb faster and farther than others.

Branching programs resemble step programs, but the intervals may be larger. Thus some pupils find themselves unable to proceed at a certain point in a step program. Because they need intermediate or smaller steps to provide them with background information, they are lead into "bypaths" which fulfill this need by means of supplementary sheets of material that can be placed in the machine. Hence the teacher may need to carefully identify and supervise the pupils for whom branching experiences should be provided.

As more is learned about programing, a greater variety of more effective cross-media materials can be included in the sequence. Several machines, now in the experimental stage, call for slides, filmstrips, audio tapes, and







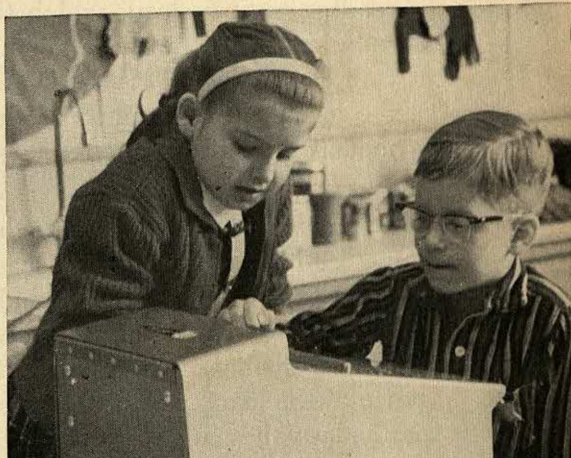


Fig. 16.3. Teaching machines are the subject of experimentation at all grade levels. These youngsters are being introduced to the responsibilities they will have in preverbal self-study. What are your reactions to their reactions? (In the first picture the teacher is loading the machine.)

sound motion-picture films (Fig. 16.1). As teaching machines are developed further, it is possible to envision the highly individualized use of many of the audiovisual materials described earlier in this book.

THE TEACHING MACHINE AND AUDIOVISUAL TECHNIQUES

Teaching may well call for the use of audiovisual materials to create resource learning opportunities and, at the same time, for the use of teaching machines to make possible independent instruction and evaluation for individual students. In such subjects as nature study, language arts, and science, the student can make effective use of sound films, prerecorded tapes, filmstrips, slides, and models and mockups of laboratory apparatus. His work with these audiovisual materials can provide him with the more subtle kind of information that cannot easily be made available in teaching machine programs, that is, resource information. The evaluation phase can be provided by teaching machines.

Thus emerges the possibility of a differentiated kind of educational opportunity that envisions a new climate of instructional materials, a new array of teaching machinery, a new kind of teaching, all organized to challenge the student.

SOME LIMITATIONS

The following are perhaps the most serious limitations of present-day teaching machine materials:

1. Many teaching machine materials rely on the principle of reinforcement of learning. The result is likely to be oversimplification and narrowness of concept building in programs where reinforcement involves a single-track approach consisting of a rather narrowly interpreted series of steps through which the pupil is to gain an understanding of broad aspects of a subject.
2. They depend too heavily on a straight-line step-by-step sequence which relies too greatly on reading ability. Thus, all the undesirable aspects of any learning situation that is too dependent on reading are multiplied in the case of teaching machine materials.
3. Teaching machine materials that are wholly "verbal" greatly increase the reading task, or load, which the pupil must face. Teaching machine programs must not continue to depend solely on a verbal medium, reading. The outcome of this dependence is to penalize the slow reader and the inefficient reader and to deprive learning of the benefits of cross-media experiences gained through the use of related audiovisual materials.

It seems reasonable to assume that as experimentation with teaching machines continues, the reading load will be decreased, a wider variety of learning experiences will be included, and other than the reinforcement of learning theory will be used in programing.

The continuing research in this field will explore the effect of the intelligence of the learners. Related questions are also likely to be investigated, particularly those which concern the effect of teaching machines on the creativity of students, the relationship between this means of instruction and maturity level, and the possibility of boredom.

SUMMARY

Teaching machine programed learning may be a means of individualizing classroom instruction in large areas of the curriculum. Areas which lend themselves most completely to automated learning techniques include spelling, arithmetic, science, language arts, and any other field in which training can be arranged in logical steps.

The use of teaching machine programs presents new responsibilities for pupils and teachers. The teachers should be alert to new information about this development, and to machines and materials now being developed. He should welcome such materials into the classroom as providing the means for doing both better and more economically some of the basic drill and routine tasks of instruction which currently absorb so much of his time and energy. He should encourage his pupils to understand better the self-initiating activities which use of the machines will call for.

Activities

1. Refer to the *Audio Visual Communication Review,* issued by the Department of Audio Visual Instruction of the NEA, for articles and research reports on continuing developments in this new field.
2. Arrange to preview *Teaching Machines,* by William Allen, and *Experiment of a Teaching Machine Program,* by Dean Huxton and Robert Corrigan, two filmstrips which describe the practical characteristics of teaching machines and discuss one sequence of a teaching machine program. The filmstrips can be obtained from Basic Skill Films, 1355 Inverness Drive, Pasadena 3, California.

Bibliography

Lumdaine, A. A., and Glaser, Robert (eds.), *Teaching Machines and Programmed Learning,* National Education Association, 1960.

Skinner, B. F., "Teaching Machines," *Science,* October 24, 1958.

Wittich, Walter Arno, "Teaching Machines: Practical and Probable," *Nation's Schools,* August, 1960, pp. 64–65, 84, 86, 88, 90.

APPENDIX: SOURCE LISTS

The following lists are intended to suggest some typical commercial sources of the various audiovisual materials discussed in this book. Numerous other sources such as government agencies, industrial concerns, airlines, railroads, and steamship lines are particularly valuable for flat pictures, posters, graphs, films, and filmstrips.

The Educators Progress Service, Randolph, Wisconsin, has a classified list of free illustrative materials including pictures, graphics, films, filmstrips, and some exhibit materials.

CHALKBOARDS; CHALKBOARD SUPPLIES

Chalkboards

Porcenell Chalkboard. Vitreous surface, steel base, magnetic. Visionell Chalkboard.

Benjamin Electric Mfg. Co., Crysteel Division, Des Plaines, Ill.

Slate Chalkboard.

W. E. Neal Slate Co., 1121 Dartmouth Ave. S.E., Minneapolis 14, Minn.

SlatoSteel Chalkboard. Porcelain or vitreous surface, steel, magnetic.

Beckley-Cardy Co., 1900 N. Narragansett St., Chicago 39, Ill.

Chalkboard Supplies

Blackboard Marking Set. Includes ¼-in. pen, semipermanent chalkboard ink, solvent for cleaning chalkboard.

Time-Saving Specialties, 2816 Dupont Ave. S., Minneapolis 8, Minn.

Blackboard Semipermanent Ink.

Time-Saving Specialties, 2816 Dupont Ave. S., Minneapolis 8, Minn.

Bulletin Board Styx. Adhesive wax.

Lea Audio-Visual Service, Sun Prairie, Wis.

Chalkboard Stencils. Ready-made perforated patterns of maps, graph outlines, etc.

Corbett Chalkboard Stencils, 548 Third Ave., N., Pelham 65, N.Y.

Magnets. Approximately ¾ x ¼ in.; strong enough to hold lightweight objects to steel chalkboards or metal display surfaces. 5¢ each and up. 40 magnets for $2 postpaid in the U.S.

Ronald Eyrich, 12720 Robin Lane, Brookfield, Wis.

CLASSROOM LIGHT-CONTROL EQUIPMENT

(In each case, brochure and samples are available on request.)

Luther O. Draper Shade Co., P.O. Box 505, Spiceland, Ind.
Fabric draperies in light-proof black, both roller shade and "Pakfold."

Duracote Corp., Ravenna, Ohio
Dura-Decor-coated Fiberglas A-V Darkening Drapes. Permanently fire-resistant, color-fast; shrink- and stretch-proof; available in four weights and a variety of colors.

Forse Manufacturing Co., 2347 Sullivan Ave., St. Louis 7, Mo.
Heavy-duty canvas draperies; tan, gray, or black; opaque or light-proof.

Hunter Douglas Div. (Flexlum), Bridgeport Brass Co., 30 Grand St., Bridgeport, Conn.
Tight-closure Venetian blinds with spring-tempered aluminum louvers. Adjust from glare-free diffused light to projection room darkness.

Levolor Lorentzen, Inc., 391 West Broadway, New York 12, N.Y.
Audiovisual Venetian blinds, aluminum; light control, decorator colors and textures.

Mackin Venetian Blind Co., 300 W. 6 St., Momence, Ill.
Venetian blind type.

Plastic Products, Inc., 1822 E. Franklin St., Richmond, Va.
Luxout plastic fire-resistant draperies, completely or partially opaque, in variety of colors; also hardware required for mounting and operating.

DISPLAY MATERIALS

Bulletin-Board Materials

Acme Bulletin Board and Directory Company, 37 E. 12 St., New York 3, N.Y.

Advance Furnace Co., 2310 E. Douglas St., Wichita, Kans.
Easels.

Bangor Cork Company, Pen Argyl, Pa.

Beckley-Cardy Company, 1900 N. Narragansett Ave., Chicago 39, Ill.

Brooks Manufacturing Company, Cincinnati 31, Ohio
Plasti-Tak, reusable adhesive.

Bulletin Board Styx, Lea Audio-Visual Service, Sun Prairie, Wis.

Bulletin Boards and Directory Products, Inc., 724 Broadway, New York 3, N.Y.

Judy Co., 310 N. 2 St., Minneapolis 1, Minn.

Magnet Sales Company, 3657 S. Vermont, Los Angeles, Calif.

Masonite Corporation, 111 W. Washington St., Chicago 2, Ill.
Pegboard display boards.

Display Surfaces and Flannel-Board Materials

Adhere-O-Learning Aids, Inc., Box 32, Wilmette, Ill.
American Felt Company, 121 Wacker Drive, Chicago 6, Ill.
Florez, Inc., 815 Bates St., Detroit 26, Mich.
Jacronda Manufacturing Company, 5449 Hunter St., Philadelphia 31, Pa.
Judy Co., 310 N. 2 St., Minneapolis 1, Minn.
Kling-Tite, c/o Follett Publishing Co., 1010 W. Washington Blvd., Chicago 7, Ill.
Oravisual Co., Inc., 321 15 Ave. S., St. Petersburg, Fla.
Program Aids Co., Inc., 550 Fifth Ave., New York, N.Y.
Self-Teaching Aids, 6435 Crenshaw Blvd., Los Angeles 43, Calif.
Technicraft, Box 1534, Petersburg, Va.
Visual Crafts Supply Company, 640 N. Willow St., Kent, Ohio.
Visual Specialties Company, 5701 W. Vernor St., Detroit 9, Mich.
John C. Winston Company, 1010 Arch St., Philadelphia, Pa.

Lettering Equipment

Carter's Ink Co., Cambridge, Mass.
Cushman and Dennison Mfg. Co., 730 Garden, Carlstadt, N.J.
Flo-master pen for speed lettering; nibs from ¼ to ⅜ in. wide.
E. Dietzgen Co., 2425 N. Sheffield Ave., Chicago, Ill.
Dri-Flo Pen Company, 716 Junction Ave., Detroit 9, Mich.
Esterbrook Pen Company, Delaware Ave. and Cooper St. Camden, N.J.
Grace Letter Company, 5 E. 47 St., New York 17, N.Y.
Graphics School Supply, Inc., Box 1185, Albany, N.Y.
Speedry brushpens.
Hernard Mfg. Company, 21 Saw Mill River Rd., Yonkers, N.Y.
C. Howard Hunt Pen Company, Camden, N.J.
Keuffel and Esser Co., 520 S. Dearborn St., Chicago, Ill.
Letterguide, Box 99, State House Station, Lincoln, Nebr.
Lockwood Company, 336 Boston Post Rd., Milford, Conn.
Dri-Rite Pen.
Mark-Tex Corp., 161 Coolidge Ave., Englewood, N.J.
Tech-pen for inking glass, metal, porcelain, paper, plastic, cloth, etc., in colors; Action Marker.
Marsh Company, Bellville, Ill.
Marsh 77 and Squeez-o-Marker.
Speedry Products, Inc., Richmond Hill 18, N.Y.
Magic Marker.

Time-Saving Specialties, 2816 Dupont Ave. S., Minneapolis 8, Minn.
Felt marking pens.
Varigraph Company, 841 W. Lakeside, Madison, Wis.
Wood-Regan Instrument Company, Nutley, N.J.
Wrico.

Letters

Artype, Inc., 549 W. Randolph St., Chicago, Ill.
Carmel Die-Cut Letters, Carmel-by-the-Sea, Carmel, Calif.
Cello-Tak Lettering Corporation, 131 W. 45 St., New York 36, N.Y.
Glassoloid Corporation of America, 32 Wellington Ave., Clifton, N.J.
Grace Letter Company, 5 E. 47 St., New York 17, N.Y.
Harry Mich Company, 1627 S. Michigan Ave., Chicago, Ill.
Hernard Mfg. Co., 21 Saw Mill River Rd., Yonkers, N.Y.
Plaster letters.
Manhattan Wood Letter Co., 151 W. 18 St., New York, N.Y.
Wood letters.
Mitten's Display Letter Company, Fifth Ave., Redland, Calif.
Mutual Aids, 1946 Hillhurst Ave., Los Angeles, Calif.
New York Wood Letter Co., 18 Green St., New York, N.Y.
Wood letters.
Redikut Letter Co., 185 N. Prairie Ave., Hawthorne, Calif.
Cardboard letters and Plasti-Tak adhesive for mounting on changeable backgrounds.
W. S. Stensgaard & Assoc., 30 Rockefeller Plaza, New York, N.Y.
Plastic letters.
Stik-a-Letter Company, Rt. 2, Box 286, Escondido, Calif.
Tablet and Ticket Co., 1021 W. Adams St., Chicago, Ill.
Gummed paper letters.

Models, Objects, and Other Three-Dimensional Materials

Audio-Visual Enterprises, 42 N. Ashland Ave., Palatine, Ill.
Milton Bradley Co., 74 Park Ave., Springfield 2, Mass.
Robert J. Brady Company Training Aids, Washington 7, D.C.
Visual training aids on biology.
Robert Brunner, Inc., 63 Fourth Ave., New York 3, N.Y.
Model of human brain.
Central Scientific Co., 1700 Irving Park Blvd., Chicago, Ill.
Models.
Clay-Adams Co., Inc., 141 E. 25 St., New York 10, N.Y.
Cutaways, models.

Creative-Playthings, Inc., 867 Madison Ave., New York 21, N.Y.
  Models.
Denoyer-Geppert Company, 5235 Ravenswood Ave., Chicago 40, Ill.
  Models.
General Biological Supply House, Inc., 8200 S. Hoyne, Chicago, Ill.
  Models, cutaways.
B. F. Goodrich Co., New Products Division, 500 S. Main St., Akron 18, Ohio.
  Koroseal flexible magnetic strip.
Imitation Food Display Co., 197 Waverly Ave., Brooklyn, N.Y.
  Models of food.
Instructional Productions Co., 2527 Honolulu Ave., Montrose, Calif.
  Transportation kits.
Louis Paul Jonas, Sculptor, R.D. #2, Hudson, N.Y.
  Miniature animals.
Judy Co., 310 N. 2 St., Minneapolis 1, Minn.
  Instructional toys, models.
Macalaster Bicknell Co., 253 Norfolk St., Cambridge 39, Mass.
  Apparatus kits.
Models of Industry, 2100 Fifth St., Berkeley, Calif.
  Also instructional materials and teaching aids.
New York Scientific Supply Co., 28 W. 30 St., New York 1, N.Y.
  Models.
A. J. Nystrom & Co., 3333 Elston Ave., Chicago 18, Ill.
  Models.
Science Materials Center, 59 Fourth Ave., New York, N.Y.
Viking Importers, 113 S. Edgemont St., Los Angeles, Calif.
  Models.
Ward's Natural Science Establishment, 3000 E. Ridge Road, Rochester, N.Y.
  Models, Bio-Plastic.
Weber-Costello Co., 1212 McKinley, Chicago Heights, Ill.
  Models.

Rubber Stamps

Beckley-Cardy Company, 1900 N. Narragansett Ave., Chicago, 39, Ill.
Krengel Manufacturing Company, 227 Fulton St., New York, N.Y.

Stencils

Arthur Brown and Brothers, Inc., 2 W. 47 St., New York 36, N.Y.
Graphic Arts Center, 1534 W. 7 St., Los Angeles, Calif.
Stenso Lettering Company, 1101 E. 25 St., Baltimore, Md.

Amco, Inc., P.O. Box 218, Port Richey, Fla.
American Museum of Natural History, Central Park West at 79th St., New York 24, N.Y.
Anti-Defamation League of B'nai B'rith, 515 Madison Ave., New York, N.Y.
Art Color Slides, Inc., 235 E. 50 St., New York 22, N.Y.
Audio-Visual Materials Bureau, Wayne University, Detroit 1, Mich.
Bailey Films, Inc., 6509 De Longpre Ave., Hollywood 28, Calif.
Block Color Productions, 1309 N. Genessee Ave., Hollywood 46, Calif.
Stanley Bowmar Co., Inc., 12 Cleveland St., Valhalla, N.Y.
British Information Services, 45 Rockefeller Plaza, New York 20, N.Y.
Herbert E. Budek Co., Inc., 324 Union St., Hackensack, N.J.
  Geography and art history.
Clay-Adams Company, Inc., 141 E. 25 St., New York 10, N.Y.
Coronet Films, Inc., 65 E. South water St., Chicago 1, Ill.
Creative Arts Studio, Inc., 814 H St. N.W., Washington, D.C.
Current Affairs, Film Division, 527 Madison Ave., New York, N.Y.
Pat Dowling Pictures, 1056 S. Robertson Blvd., Los Angeles 35, Calif.
DuKane Corporation, St. Charles, Ill.
Educational Screen & Audio-Visual Guide, 2052 N. Lincoln Park, Chicago, Ill.
Encyclopædia Britannica Films, Inc., 1150 Wilmette Ave., Wilmette, Ill.
Eulo Company, Box 178, Denver 1, Colo.
Filmfax Productions, 80 W. 40 St., New York, N.Y.
Filmstrip Distributors, Sierre Madre, Calif.
Filmstrip House, 347 Madison Ave., New York, N.Y.
Hamilton Color Slides, 127 N. Second St., Hamilton, Ohio.
Informative Classroom Picture Publishers, 31 Ottawa Ave. N.W., Grand Rapids, Mich.
International Film Bureau, Inc., 332 S. Michigan Ave., Chicago, Ill.
The Jam Handy Organization, 2821 E. Grand Blvd., Detroit 11, Mich.
E. Taylor Judd, Box 711, Delevan, Wis.
Key Productions, Inc., Current Affairs Films Division, 527 Madison Ave., New York 22, N.Y.
Keystone View Company, Hamilton and Crandall St., Meadville, Pa.
Knowledge Builders, 31 Union Square, New York, N.Y.
Life Magazine, Inc., Filmstrip Division, Time & Life Bldg., New York, N.Y.
Long Filmslide Service, 7505 Fairmount Ave. El Cerrito, Calif.
McGraw-Hill Book Co., Text-Film Dept., 330 W. 42 St., New York 36, N.Y.
Meston's Travels, Inc., 3801 N. Piedras, El Paso, Tex.
Metropolitan Museum of Art, Fifth Ave. and 82 St., New York 38, N.Y.

Moody Institute of Science, Educational Film Division, 11428 Santa Monica Blvd., West Los Angeles 25, Calif.
National Audubon Society, Photo and Film Dept., 1130 Fifth Ave., New York 38, N.Y.
National Film Board of Canada, 680 Fifth Ave., New York 20, N.Y.
New York Times, Office of Educational Activities, 229 W. 43 St., New York 18, N.Y.
New York Times, School Service Dept., 220 West 43 St., New York 18, N.Y.
Nu-Art Films, Inc., 87–28 57th Ave., Elmhurst, N.Y.
Photo & Sound Company, 116 Natoma St., San Francisco, Calif.
Pictorial Events, 220 Central Park S., New York, N.Y.
Popular Science Pub. Co., Audio-Visual Division, 355 Lexington Ave., New York, N.Y.
Dr. Konrad Prothman, 2787 Milburn Ave., Baldwin, L.I., N.Y.
Sawyer's Inc., 8585 S.W. Highway 217, Portland 7, Oreg.
Society for French-American Cultural Services and Educational Aid, 972 Fifth Ave., New York 21, N.Y.
Society for Visual Education, Inc., 1345 Diversey Parkway, Chicago 14, Ill.
Stori-Views, 3312 Lindell Blvd., St. Louis 3, Mo.
United Nations, Films & Visual Information Div., New York, N.Y.
United World Films, Inc., 1445 Park Ave., New York 29, N.Y.
VEC, Inc., 2066 Helena St., Madison 4, Wis.
Vocafilm Corporation, 424 Madison Ave., New York 17, N.Y.

Large Transparency Materials

Ansco, Binghamton, N.Y.
Charles Beseler Company, 219 S. 18 St., East Orange, N.J.
  General supplies.
Arthur Brown and Brothers, Inc., 2 W. 47 St., New York 36, N.Y.
  "Frisket," a plastic material for lifting materials from the printed page.
Eastman Kodak Company, 343 State St., Rochester 4, N.Y.
Ozalid Division, General Aniline and Film Corporation, Johnson City, N.Y.
Technifax Corporation, 195 Appleton St., Holyoke, Mass.
Thermofax-Color Lift, c/o Minnesota Mining and Manufacturing Company, 900 Bush Ave., St. Paul, Minn.
  Vu-Graph transparency transfer process.
Transpara, Seal, Inc., Shelton, Conn.
  Magazine page lift materials.
Victorlite Industries, Inc., 4117 W. Jefferson Blvd., Los Angeles 16, Calif.
  General supplies and prepared materials.

Microfilms and Microcards

Eastman Kodak Company, 343 State St., Rochester 4, N.Y.
  Recordak Microfilm viewers; Microprint readers.
Microcard Corporation, West Salem, Wis.
Microlex Corporation, 1 Graves St., Rochester 14, N.Y.
  Microcards.
Microtext Publishing Corporation, 112 Liberty St., New York 6, N.Y.
  Microcards.
Readex Microprint Corporation, 100 Fifth Ave., New York 11, N.Y.
  Microcards.
University Microfilms, 313 N. First St., Ann Arbor, Mich.
University of Rochester Press, Micropublication Service, Rochester, N.Y.
  Microcards.

Sensitized Plastic Sheets

Charles Beseler Company, 219 S. 18 St., East Orange, N.J.
Ozalid Division, General Aniline and Film Corporation, Johnson City, N.Y.

Language Laboratory Equipment

Audio Teaching Center, 137 Hamilton St., New Haven, Conn.
Audiotronics Corp., 11057 Weddington St., North Hollywood, Calif.
Brunswick Corp., 2605 E. Kilgore Rd., Kalamazoo, Mich.
DuKane Corporation, St. Charles, Ill.
Electronic Classrooms, Inc., 11800 W. Olympic Blvd., Los Angeles 64, Calif.
Langua-Lab, Inc., 167 Chestnut St., Albany 10, N.Y.
Monitor Language Laboratories Booths, 5034 Wisconsin Ave. N.W., Washington 16, D.C.
Neumade Products Corp., 250 W. 57 St., New York, N.Y.
Science Electronics, Inc., 195 Massachusetts Ave., Cambridge, Mass.
Universal Electronics Laboratories Corp., 510 Hudson St., Hackensack, N.J.
Webcor Sales Company, 5610 W. Bloomingdale Ave., Chicago 39, Ill.
Wible Language Institute, Allentown, Pa.

MAPS AND GLOBES

Aero Service Corporation, 210 Courtland St., Philadelphia 20, P.A.
  Plastic relief maps.
American Map Co., 16 E. 42 St., New York, N.Y.
George F. Cram Co., 730 E. Washington St., Indianapolis 6, Ind.
Denoyer-Geppert Company, 5235 Ravenswood Ave., Chicago 40, Ill.
A. B. Dick Co., 5700 W. Touhy, Niles, Ill.
  Map stencils.

Farquhar Transparent Globes, 3724 Irving St., Philadelphia 4, Pa.
Geo-Physical Maps, Inc., School Division, 101 Park Ave., New York 17, N.Y.
C. S. Hammond & Co., 521 Fifth Ave., New York 17, N.Y.
  Maps.
McKinley Publishing Co., 809 N. 19 St., Philadelphia, Pa.
  Maps.
National Geographic Society, 16th and M Sts., Washington, D.C.
  Maps.
A. J. Nystrom & Co., 3333 Elston Ave., Chicago 18, Ill.
Rand McNally & Co., 8255 Central Park Ave., Skokie, Ill.
Replogle Globes, 1901 N. Naraganset, Ill.
Weber-Costello Co., 1212 McKinley, Chicago Heights, Ill.

MOTION-PICTURE FILMS (16mm.)

Academy Films, 1145 N. Las Palmas Ave., Hollywood 38, Calif.
Bailey Films, Inc., 6509 De Longpre Ave., Hollywood 28, Calif.
Arthur Barr Productions, Inc., 1265 Bresee Ave., Pasadena, Calif.
Churchill-Wexler Film Productions, 807 N. Seward, Los Angeles 38, Calif.
Columbia University Press, Center for Mass Communication, 1125 Amsterdam Avenue, New York 25, N.Y.
Coronet Films, 65 E. South Water St., Chicago 1, Ill.
Walt Disney Productions, 16mm. Film Division, 2400 W. Alameda Ave., Burbank, Calif.
Encyclopædia Britannica Films, Inc., 1150 Wilmette Ave., Wilmette, Ill.
Films of the Nations, Inc., 62 W. 45 St., New York, N.Y.
Frith Films, 1816 N. Highland Ave., Hollywood, Calif.
Heidenkamp Nature Pictures, 538 Glen Arden Drive, Pittsburgh, Pa.
Paul Hoefler Productions, P.O. Box 1313, La Jolla, Calif.
Indiana University, Audio-Visual Center, Bloomington, Ind.
International Film Bureau, Inc., 332 S. Michigan Ave., Chicago 4, Ill.
International Film Foundation, Inc., 1600 Broadway, New York, N.Y.
Iowa State College, Visual Instruction Service, Ames, Iowa.
Johnson-Hunt Productions, Film Center, La Canada, Calif.
McGraw-Hill Book Co., Text-Film Dept., 330 W. 42 St., New York 36, N.Y.
Carl F. Mahnke Productions, 215 E. 3 St., Des Moines, Iowa.
Michigan State University, Audiovisual Center, East Lansing, Mich.
Moody Institute of Science, 11428 Santa Monica Blvd., West Los Angeles 25, Calif.
National Educational Television and Radio Center, 10 Columbus Circle, New York 19, N.Y.

New York University Film Library, Distribution Dept., 26 Washington Place, New York, N.Y.

Pan American World Airways System, 28–19 Bridge Plaza North, Long Island City, N.Y.

Pennsylvania State University, Audio-Visual Library, University Park, Pa. (Also Psychological Cinema Register.)

Purdue University, Audio-Visual Center, Lafayette, Ind.

State University of Iowa, Bureau of Audio-Visual Instruction, Extension Division, Iowa City, Ia.

Syracuse University, Audio-Visual Education Center, Collandale at Lancaster, Syracuse, N.Y.

Teaching Film Custodians, Inc., 25 W. 43 St., New York, N.Y.

U.S. Department of Agriculture, Motion Picture Service, Office of Information, Washington, D.C.

U.S. Department of the Air Force, Directorate of Public Relations, Pictorial Branch, Washington, D.C.

U.S. Department of the Interior, Bureau of Mines, Graphics Services, 4800 Forbes St., Pittsburgh 13, Pa.

U.S. Department of the Interior, Fish & Wildlife Service, Washington, D.C.

U.S. Department of Justice, Federal Bureau of Investigation, Washington, D.C.

U.S. Forest Service, Washington, D.C.

United World Films, 1445 Park Ave., New York 29, N.Y.

University of California, Dept. of Visual Instruction, Univ. Extension, 2272 Union St., Berkeley, Calif.

University of Michigan, Audio-Visual Education Center, Frieze Building, Ann Arbor, Mich.

University of Minnesota, Film Production Division, Minneapolis, Minn.

University of Nebraska, Bureau of Audio-Visual Instruction, Extension Division, Lincoln 8, Nebr.

University of Oklahoma, Educational Materials Department, Extension Division, Norman, Okla.

University of Southern California, Department of Cinema, Filmstrip Distribution Division, University Park, Los Angeles 7, Calif.

University of Wisconsin, Bureau of Audio-Visual Instruction, Univ. Extension, 1312 W. Johnson St., Madison 6, Wis.

Virginia State Board of Education, Film Production Service, Richmond, Va.

PICTURES AND GRAPHICS

Charts and Graphs

Aero Service Corporation, 210 Courtland St., Philadelphia 20, Pa.

Allied Chemical and Dye Corporation, Barrett Division, 75 West St., New York 6, N.Y.
Aluminum Company of America, Pittsburgh 19, Pa.
  "Aluminum—Its Story."
American Chart Service, Inc., 101 Dover St., Somerville 44, Mass.
American Forest Products Industries, 1816 N Street, N.W., Washington 6, D.C.
American Optical Company, Instrument Division, Buffalo 15, N.Y.
American Petroleum Institute, 50 W. 50 St., New York 20, N.Y.
American Tree Association, 1212 16 St. N.W., Washington, D.C.
Clay-Adams Company, Inc., 141 E. 25 St., New York 10, N.Y.
Coca-Cola Company, Inc. (Inquire of local bottler.)
Educators Mutual Insurance Co., Lancaster, Pa.
General Motors Co., Dept. of Public Relations, Detroit 2, Mich.
Hayden Planetarium, 81st St. and Central Park West, New York 24, N.Y.
Kellogg's Home Economics Dept., Battle Creek, Mich.
National Forum, Inc., 407 S. Dearborn St., Chicago 5, Ill.
National Industrial Conference Board, Inc., 460 Park Ave., New York 22, N.Y.
National Society for the Prevention of Blindness, Inc., 1790 Broadway, New York 19, N.Y.
State Teachers' Magazines, 307 N. Michigan Ave., Chicago 1, Ill.
U.S. Forest Service, Education Section, Washington, D.C.
Ward's Natural Science Establishment, 3000 East Ridge Road, Rochester, N.Y.
Westinghouse Electric Corp., 246 E. 4 St., Mansfield, Ohio.

Flat Pictures

Air Age Education Research, 80 E. 42 St., New York 17, N.Y.
American Museum of Natural History, Central Park West at 79th St., New York 24, N.Y.
Artext Prints, Inc., Westport, Conn.
Audio-Visual Enterprises, 4405 Springdale Dr., Los Angeles 43, Calif.
British Information Services, 45 Rockefeller Plaza, New York 20, N.Y.
Colonial Art Co., 1336–8 N.W. First St., Oklahoma City 4, Okla.
Creative Education Society, Mankato, Minn.
Friendship Press, 475 Riverside Drive, New York 27, N.Y.
Greyhound Information Center, P.O. Box 815, Chicago 90, Ill.
  U.S. travel pictures.
Hi Worth Pictures, 1499 E. Walnut St., Pasadena 4, Calif.
Informative Classroom Pictures Publishers, 31 Ottawa Ave. N.W., Grand Rapids, Mich.
International Communications Foundation, 9033 Wilshire Blvd., Beverly Hills, Calif.

Kits of pictures, sound filmstrips, graphics, and 3-D materials from various countries.

Latin American Village Studio, P.O. Box 3097, Santa Barbara, Calif.

Motion Pictures Association of America, Inc., 1600 Eye St. N.W., Washington, D.C.

National Geographic Society, 16th and M Sts., Washington, D.C.

F. A. Owen Publishing Co., Dansville, N.Y.

Perry Pictures Co., Box 4, Malden, Mass.

Realistic Visual Aids, Highland, Calif.

State Teachers Magazine, Inc., Dept. E, 307 N. Michigan Ave., Chicago, Ill.
Travel pictures.

Free and Inexpensive Materials

Catalog of Free Teaching Aids, Gordon Salisburn and Robert Sheridan, Box 943, Riverside, Calif. Revised regularly.

Elementary Teachers' Guide to Free Curriculum Materials, Educators Progress Service, Randolph, Wis. Revised annually.

Free and Inexpensive Learning Materials, Division of Surveys and Field Services, George Peabody School for Teachers, Nashville 5, Tenn. Revised annually.

Free and Inexpensive Materials on World Affairs, Leonard S. Kenworthy, Public Affairs Press, Washington, D.C.

Sources of Free and Inexpensive Materials, Educational Division, Field Enterprises, Inc., Merchandise Mart Plaza, Chicago 54, Ill. Revised regularly.

Sources of Free and Inexpensive Pictures for the Classroom, Bruce Miller, Box 369, Riverside, Calif. Revised annually. This source also publishes other general listings of free teaching aids.

Instructional Comics

Educational Comics, Inc., 225 Lafayette St., New York, N.Y.

General Electric Co., Educational Service Division, Dept. 6–235A, Schenectady, N.Y.

Gilbertson Company, Inc., 101 Fifth Avenue, New York 3, N.Y.

Swift and Co., Educational Services, Union Stock Yards, Chicago, Ill.

Picture-Mounting Materials

Henry H. Grant, P.O. Box 366, Redondo Beach, Calif.
Chartex.

Seal, Inc., Brook St., Shelton, Conn.

Posters

American Dental Association, 222 E. Superior St., Chicago, Ill.

American Humane Education Society, 180 Longwood Ave., Boston, Mass.

Atchison, Topeka, and Santa Fe Railway System, 80 E. Jackson Blvd., Chicago, Ill.
Cunard Line, 25 Broadway, New York, N.Y.
French Line, Educational Department, 610 Fifth Ave., New York, N.Y.
General Mills, Education Section, Dept. of Public Services, Minneapolis, Minn.
Hamburg American Line, c/o U.S. Navigation Company, General Agents, 17 Battery Place, New York, N.Y.
National Safety Council, 425 N. Michigan Ave., Chicago, Ill.
Pan American World Airways System, 28–19 Bridge Plaza North, Long Island City, N.Y.
Westinghouse Electric Corp., School Service Dept., 306 Fourth Ave., Pittsburgh, Pa.
Wild Flower Preservation Society, Inc., 3740 Oliver St. N.W., Washington, D.C.

PROJECTORS

Automatic Continuous Slide and/or Filmstrip Projectors

Graflex, Inc., 3750 Monroe Ave., Rochester 3, N.Y.
Optics Manufacturing Corporation, Willard and Amber Sts., Philadelphia, Pa.
Spindler & Sauppe, 2201 Beverly Blvd., Los Angeles, Calif.
Viewlex, 3501 Queens Blvd., Long Island City 1, N.Y.

Filmstrip and/or Slide Projectors

American Optical Co., 885 Main St., Chelsea, Mass.
Argus Cameras, Inc., Sales Service Div., 405 Fourth St., Ann Arbor, Mich.
Audio-Master Corp., 17 E. 45 St., New York 17, N.Y.
Automatic Projection Corp., 545 Fifth Ave., New York 1, N.Y.
Bausch & Lomb Optical Co., 626 St. Paul St., Rochester 2, N.Y.
Bell & Howell Co., 7100 McCormick Road, Chicago 45, Ill.
Charles Beseler Company, 219 S. 18 St., East Orange, N.J.
Brumberger Sales Corp., 34–34th St., Brooklyn 32, N.Y.
DuKane Corporation, St. Charles, Ill.
Eastman Kodak Company, 343 State St., Rochester 4, N.Y.
Karl Heitz, Inc., 480 Lexington Ave., New York 17, N.Y.
Keystone View Company, Hamilton and Crandall St., Meadville, Pa.
E. Leitz, Inc., 468 Park Ave., South, New York 16, N.Y.
Naren Industry, Inc., 2104–06 N. Orchard St., Chicago 14, Ill.
Revere Camera Co., 320 E. 21 St., Chicago 16, Ill.
Society for Visual Education, Inc., 1345 Diversey Parkway, Chicago 14, Ill.
Standard Projector & Equipment Co., 7106 W. Touhy Ave., Chicago 31, Ill.

Three Dimension Co., Division of Bell & Howell, 3512 N. Kostner Ave., Chicago 45, Ill.
Viewlex, 3501 Queens Blvd., Long Island City 1, N.Y.

Microprojectors

American Optical Co., Instrument Div., 155 E. 44 St., New York 17, N.Y.
Bausch & Lomb Optical Co., 626 St. Paul St., Rochester 2, N.Y.
Bioscope Manufacturing Co., Box 1492, Tulsa, Okla.
Karl Heitz, Inc., 480 Lexington Ave., New York 17, N.Y.
Society for Visual Education, Inc., 1345 Diversey Parkway, Chicago 14, Ill.
Universal Seoscope Co., 1632 N.W. 5 St., Oklahoma 6, Okla.

Opaque Projectors

American Optical Co., 885 Main St., Chelsea, Mass.
Bausch & Lomb Optical Co., 626 St. Paul St., Rochester 2, N.Y.
Charles Beseler Company, 219 S. 18 St., East Orange, N.J.
Karl Heitz, Inc., 480 Lexington Ave., New York 17, N.Y.
Keystone View Company, Hamilton and Crandall St., Meadville, Pa.
Lacey-Luci Products Co., 31 Central Ave., Newark 2, N.J.
Projection Optics Company, Inc., 330 Lyell Ave., Rochester 6, N.Y.
Squibb Taylor, Inc., 1213 South Akard St., Dallas, Tex.

Overhead Transparency Projectors

American Optical Co., 885 Main St., Chelsea, Mass.
Charles Beseler Company, 219 S. 18 St., East Orange, N.J.
Minnesota Mining & Manufacturing Company, 900 Bush Ave., St. Paul, Minn.
Victorlite Industry, Inc., 4117 W. Jefferson Blvd., Los Angeles, Calif.

Sound Filmstrip Projectors

Audio-Master Corp., 17 E. 45 St., New York 17, N.Y.
Automatic Projection Corp., 545 Fifth Ave., New York 1, N.Y.
DuKane Corporation, St. Charles, Ill.
Electronic Teaching Laboratories, 5034 Wisconsin Ave., Washington 6, D.C.
Hollywood Sound & Lighting Co., 1535 Ivar, Hollywood, Calif.
McClure Projectors, Inc., 1122 Central Ave., Chicago, Ill.
Society for Visual Education, Inc., 1345 Diversey Parkway, Chicago 14, Ill.
Viewlex, 3501 Queens Blvd., Long Island City 1, N.Y.

Sound Motion-Picture Projectors (16mm.)

Bell & Howell Co., 7100 McCormick Road, Chicago 45, Ill.
Eastman Kodak Company, 343 State St., Rochester 4, N.Y.

Graflex, Inc., 3750 Monroe Ave., Rochester 3, N.Y.
Harwold Co., 1245 Chicago Ave., Evanston, Ill.
Paillard, Inc., 100 Sixth Ave., New York 13, N.Y.
Radio Corp. of America, Audio-Visual Products, Bldg. 15–5, Camden, N.J.
Revere Camera Co., 320 E. 21 St., Chicago 16, Ill.
Victor Animatograph Corp., Plainville, Conn.

Sound Motion-Picture Projectors (16mm. Special Magnetic Sound Type)

Bell & Howell Co., 7100 McCormick Road, Chicago 45, Ill.
Eastman Kodak Company, 343 State St., Rochester 4, N.Y.
Radio Corp. of America, Audio-Visual Products, Bldg. 15–5, Camden, N.J.
Victor Animatograph Corp., Plainville, Conn.

Three-Dimensional Slide Projectors

Compco Corp., 8747 Saint Louis, Chicago 47, Ill.
Sawyer's Inc., 8585 S.W. Highway 217, Portland 7, Oreg.
Spindler & Sauppe, 2201 Beverly Blvd., Los Angeles, Calif.
Three Dimension Co., Division of Bell & Howell, 3512 N. Kostner Ave., Chicago 45, Ill.

3¼″ by 4″ Slide Projectors

American Optical Co., 885 Main St., Chelsea, Mass.
Bausch & Lomb Optical Co., 626 St. Paul St., Rochester 2, N.Y.
Charles Beseler Company, 219 S. 18 St., East Orange, N.J.
Keystone View Company, Hamilton and Crandall St., Meadville, Pa.

RADIO RECEIVERS, AM-FM

Newcomb-Audio, 6824 Lexington Ave., Hollywood, Calif.
Zenith Sales Corp., 6001 West Dickens Ave., Chicago 39, Ill.

RECORD AND TRANSCRIPTION PLAYERS

Audio-Master Corp., 17 E. 45 St., New York 17, N.Y.
DuKane Corporation, St. Charles, Ill.
Newcomb Audio Products Company, 6824 Lexington Ave., Hollywood 38, Calif.
Rheem Califone Corp., 1020 N. La Brea Ave., Hollywood 38, Calif.
U.S. Recording Co., 1121 Vermont Ave. N.W., Washington 5, D.C.
Webcor Sales Company, 5610 W. Bloomingdale Ave., Chicago 39, Ill.

RECORDINGS AND TRANSCRIPTIONS

American Library Association, 50 E. Huron St., Chicago 11, Ill.
Audio-Education, Inc., 55 Fifth Ave., New York 3, N.Y.
Bethlehem Records, Hollywood, Calif.
Book-Records, Inc., 222 E. 47 St., New York 17, N.Y.
Bowmar Records, 4921 Santa Monica Blvd., Los Angeles 29, Calif.
Cadence Records, 40 E. 49 St., New York 17, N.Y.
Caedmon Sales Corporation, 277 Fifth Ave., New York 16, N.Y.
Gloria Chandler Recordings, 277 W. 12 St., New York 14, N.Y.
Children's Music Center, 2858 W. Pico Blvd., Los Angeles 6, Calif.
Children's Reading Service, 1078 St. John's Pl., Brooklyn 13, N.Y.
Children's Record Guild, 27 Thompson St., New York 13, N.Y.
Comstock University Records, 124 Roberts Place, Cornell Heights, Ithaca, N.Y.
Concord Records Corp., 519 S. Fifth Ave., Mt. Vernon, N.Y.
Decca Distributing Corp., 321 E. Chicago St., Milwaukee, Wis.
Disneyland Records, 2400 W. Alameda Ave., Burbank, Calif.
Enrichment Records, 246 Fifth Ave., New York 1, N.Y.
Epic Records, 799 Seventh Ave., New York 19, N.Y.
Folkways Records and Service Corp., 117 W. 46 St., New York 36, N.Y.
Harry S. Goodman, Radio Productions, 19 E. 53 St., New York, N.Y.
Harcourt, Brace & World, Inc., 750 Third Ave., New York 17, N.Y.
Kayden Records, 2754 Ventura Blvd., Studio City, Calif.
Linguaphone Institute, 30 Rockefeller Plaza, New York 20, N.Y.
London Records, 539 W. 25 St., New York 1, N.Y.
Music Appreciation Records, c/o Book-of-the-Month Club, Inc., 345 Hudson St., New York 14, N.Y.
National Council of Teachers of English, 221 W. 68 St., Chicago, Ill.
Poetry Records, 475 Fifth Ave., New York 17, N.Y.
RCA Victor Division, Radio Corporation of America, Educational Services, Camden, N.J.

TAPE MATERIALS AND EQUIPMENT

Tape Recorders and Playbacks

Bell & Howell Co., 7100 McCormick Road, Chicago 45, Ill.
Newcomb Audio Products, 6824 Lexington Ave., Hollywood 38, Calif.
Radio Corp. of America, Cherry Hill, Camden 8, N.J.
Revere Camera Co., 320 E. 21 St., Chicago 16, Ill.
Webcor Sales Company, 5610 W. Bloomingdale Ave., Chicago 39, Ill.
Webster Electric Co., 1900 Clark St., Racine, Wis.
Wollensack Optical Company 20 East 21 St. Chicago 16, Ill.

Tape Recording Services and Libraries

The following institutions maintain libraries or service centers. Catalogues of tape-recorded programs suitable for most curriculum areas are available on request. Most of these institutions will, for a small fee, transcribe selected programs on to tapes supplied by schools; these tapes may be kept by the schools.

Division of Audio-Visual Aids, State Department of Education, Rhode Island College, 600 Mt. Pleasant Ave., Providence, R.I.
Film Library Division of Supervised Study, State University Station, Fargo, N.D.
National Education Association, Department of Audio-Visual Instruction, 1201 Sixteenth St. N.W., Washington 6, D.C.
Oklahoma State University, Audio-Visual Center, Stillwater, Okla.
Tapes for Teaching, Education Dept., Centennial Bldg., St. Paul 1, Minn.
University of Connecticut, Audio-Visual Center, Storrs, Conn.
University of Illinois, Visual Aids Service, Champaign, Ill.
University of Iowa, Bureau of Audio-Visual Instruction, Iowa City, Iowa.
University of Michigan, Audio-Visual Education Center, Ann Arbor, Mich.
University of Nebraska, Bureau of Audio-Visual Instruction, Lincoln, Nebr.
University of New Hampshire, Audio-Visual Center, Durham, N.H.
University of Oklahoma, Educational Materials Services, Norman, Okla.

Tape Recordings

Educators Progress Service, Randolph, Wis.
EMC Recordings Corp., 806 E. 7 St., St. Paul 6, Minn.
Phonotapes Inc., 853 Ninth Ave., New York 17, N.Y.
Shakespeare Tape Library, 1818 M St. N.W., Washington, D.C.

TEACHING MACHINES AND PROGRAMS

American Systems, Inc., 1625 East 126th St., Hawthorne, Calif.
Applied Communications Systems (Division of Litton Systems), 18107 Sherman Way, Reseda, Calif.
Audiotronics Corp., 11057 Weddington St., North Hollywood, Calif.
Basic Systems, Inc., 42 E. 52 St., New York, N.Y.
Center for Programed Instruction, 365 West End Ave., New York 24, N.Y.
Corrigan Communications, Inc., 8701 Adah St., Garden Grove, Calif.
Doubleday & Company, Garden City, N.Y.
Dyna Slide Co., 600 So. Michigan Ave., Chicago 5, Ill.
Educational Developmental Laboratories, Inc., 75 Prospect St., Huntington, N.Y.
Electronic Teaching Laboratories, 5034 Wisconsin Ave. N.W., Washington 16, D.C.
Foringer & Company, Inc., 312 Maple Drive, Rockville, Md.
Fridel Manufacturing Co., Baytown, Tex.

General Atronics Corp., 1 Bala Ave., Bala-Cynwood, Pa.

General Programmed Teaching Corp., 1719 Girard N.E., Albuquerque, N.M.

Graflex, Inc., Special Products & Services, Rochester 3, N.Y.

The Grolier Society, Inc., Americana Corp., Teaching Materials Corp., 575 Lexington Ave., New York 22, N.Y.

Hamilton Research Associates, Inc., Route 5A, New Hartford, N.Y.

Harcourt, Brace & World, Inc., Dept. of Programmed Instruction, 750 Third Ave., New York 17, N.Y.

Hughes Aircraft Co., Industrial Systems Division, Box 90904 Airport Station, Los Angeles 45, Calif.

INRAD—Institute of International Research and Development, Inc., Box 4456, Lubbock, Tex.

Koncept-O-Graph Corp., 179 Berkeley St., Rochester 7, N.Y.

Learning Incorporated, 1317 W. Eighth St., Tempe, Ariz.

McGraw-Hill Book Company, 330 W. 42 St., New York 36, N.Y.; Technical Writing Service, Same address.

National Teaching Machines, Box 4016, El Paso, Tex.

Perceptual Development Laboratories, 6746 Southwest Ave., St. Louis 17, Mo., and 6320 Ogden Ave., Borwyn, Ill.

Prentice-Hall, Inc., Industrial Dept., Englewood Cliffs, N.J.

Programmed Teaching Aids, Inc., 3810 So. Four Mile Run Drive, Arlington 6, Va.

Psychotechnics, Inc., 105 West Adams St., Chicago, Ill.

Recordak Corp., 415 Madison Ave., New York 17, N.Y.

Rheem Califone Corp., 5922 Bowcroft St., Los Angeles 16, Calif.

Science Research Associates, 259 E. Erie St., Chicago 11, Ill.

Smith Harrison, Inc., Box 717, Devon, Pa.

Syncromat Equipment Corp., 156 West Michigan, Jackson, Mich.

Systems Development Corp., Santa Monica, Calif.

Teaching Machines, Inc., 235 San Pedro N.E., Albuquerque, N.M.

Technical Service, Inc., 30865 W. Five Mile Road, Livonia, Mich.

Technifax Corporation, 195 Appleton St., Holyoke, Mass.

TEMAC, Programmed Learning Materials Division, Encyclopaedia Britannica Films, 1150 Wilmette Ave., Wilmette, Ill.

Thompson Ramo Wooldridge, Inc., Educational Electronics Division, 532 Sylvan Ave., Englewood Cliffs, N.J.; Intellectronics Laboratories, Ramo-Wooldridge Division, Canoga Park, Calif.

TOR Education, Inc., Tuscaloosa, Ala.

Varian Associates, Palo Alto, Calif.

Viewlex, Inc., 4 Broadway, Holbrook, Long Island, N.Y.

Western Design & Electronics, Division of U.S. Industries, Inc., Santa Barbara Airport, Goleta, Calif.

World Book Encyclopaedia Co., Merchandise Mart, Chicago, Ill.

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